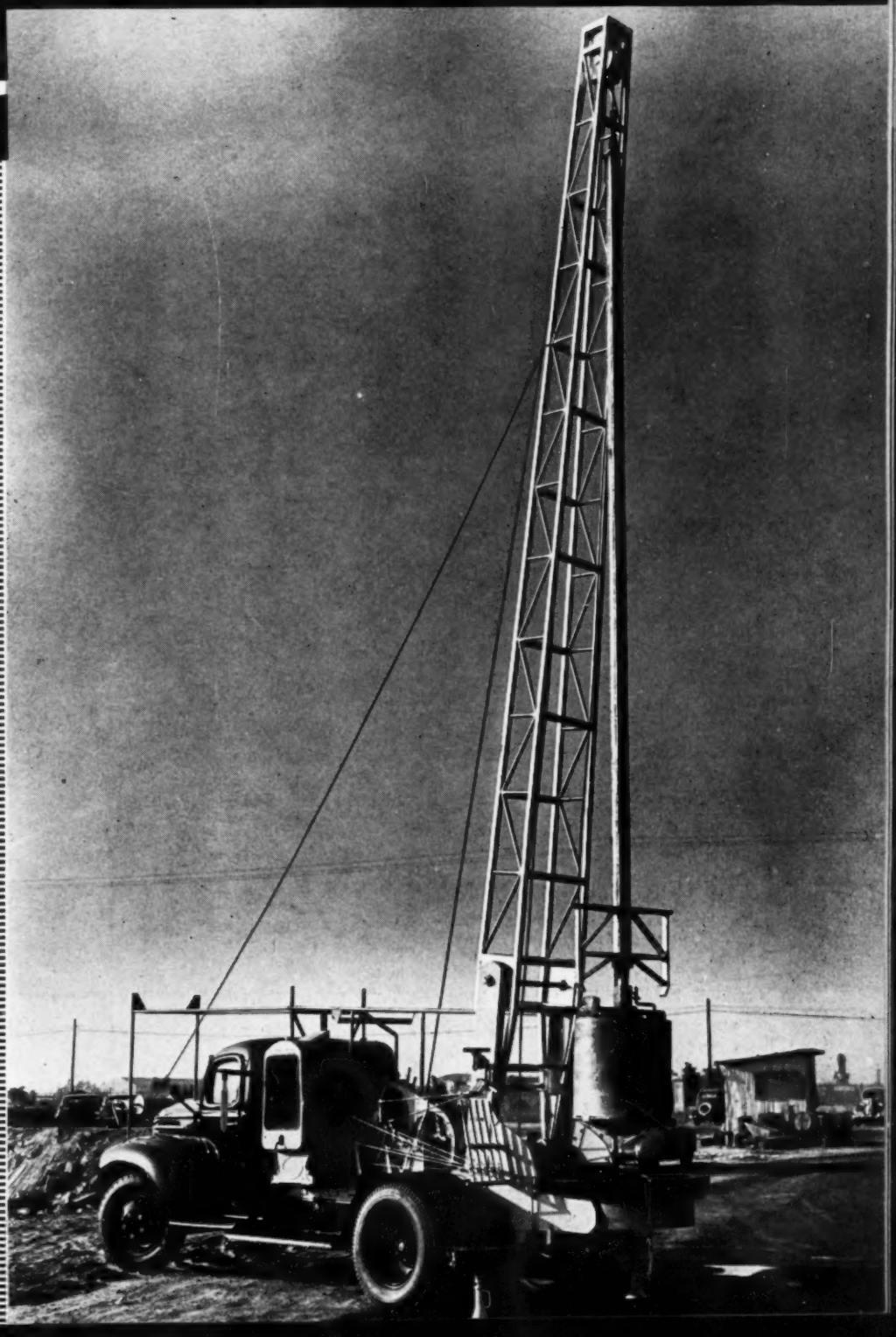
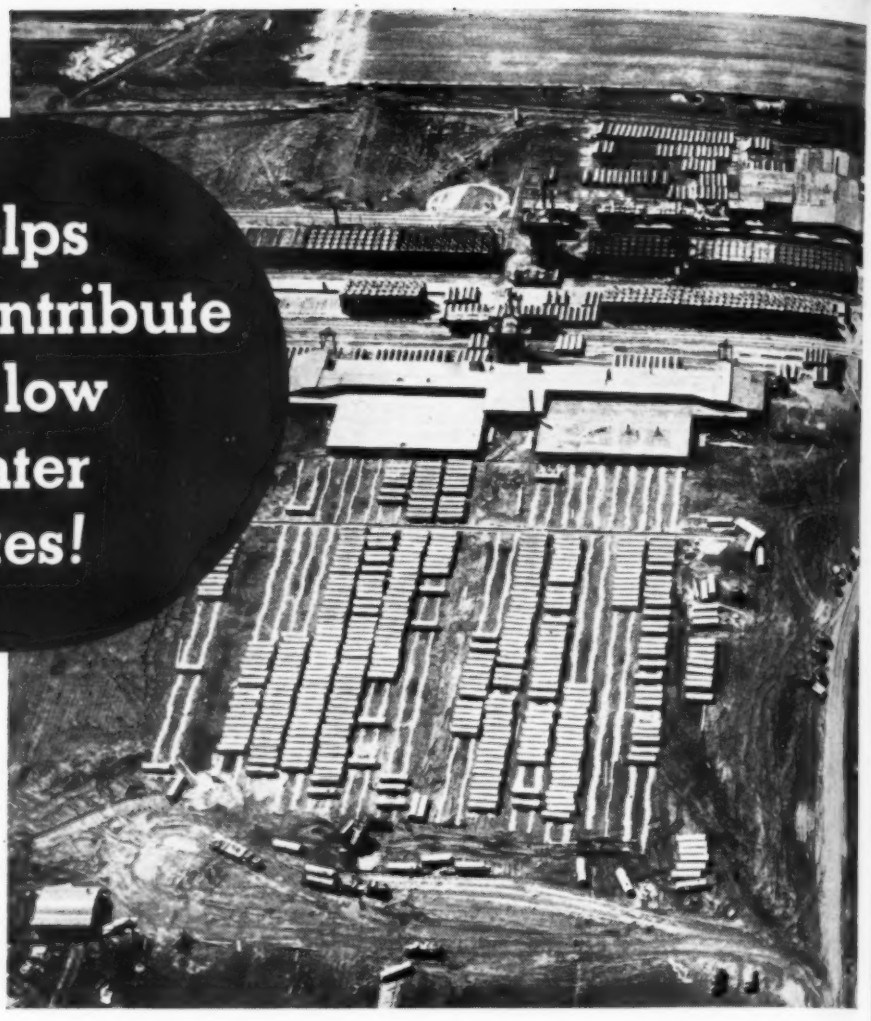
WATER & SEWAGE WORKS



DRILLING RIG
Used
in Exploring
Ground Conditions
Along Sewer
Right of Way

LOCK JOINT PIPE helps contribute to low water rates!



A temporary Lock Joint pipe plant at the site. Use of local labor and materials returns to the community a large part of the pipeline cost.

Although a modern water supply system represents a sizeable investment, sound engineering makes it possible to keep water rates at a minimum.

Knowing this, economy-minded water supply engineers specify Lock Joint Reinforced Concrete Pressure Pipe for mains of 16" or larger. Lock Joint's low initial cost, its long life, its exceptionally high carrying capacity and its negligible maintenance cost assure the utmost service for the consumer's dollar.

Water works officials who have installed Lock Joint pipe lines point to these lines as the most economical in their entire systems.

We shall be glad to discuss your requirements. Simply write or call our nearest office.

Lock Joint's easy installation means low laying cost.

LOCK JOINT PIPE COMPANY

Est. 1905

P.O. Box 269, East Orange, N. J.

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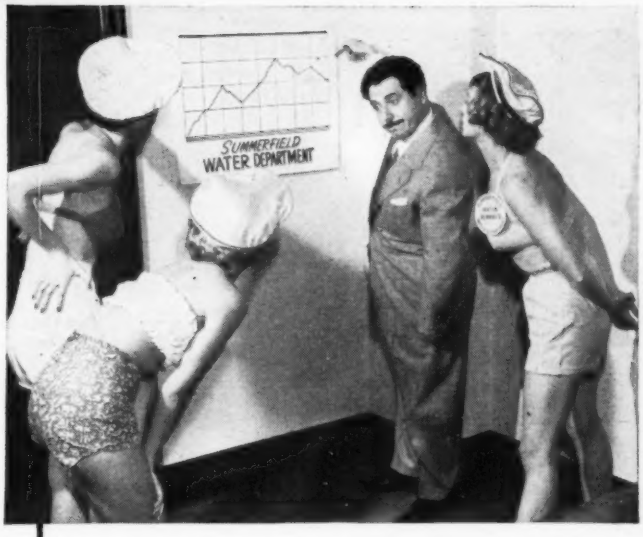
BRANCH OFFICES: Cheyenne, Wyo. • Denver, Colo. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. August, 1949, Volume 96. Number 8. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second-class matter March 4, 1948, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879.
Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N.Y.

Having decided the essential and noble art of meter reading needs glamour, Summerfield's ebullient Water Commissioner Gildersleeve interviews applicants for job of Meter Readerette.



"Summerfield's water sales are dripping . . . I mean dropping. We gotta get behind this drive and create more water demand," says Gildy as he explains duties to newly hired trio.

"This," expounds the Commissioner, "is a Pittsburgh Water meter, a gadget that will charge for every drop of water. Little arrows go round and round and water comes out here."

Seriously speaking, there's nothing that equals the accuracy of Pittsburgh-Empire meters. Use them for profit.

Next month Commissioner Gildersleeve explains the importance of accuracy—

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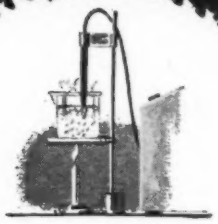

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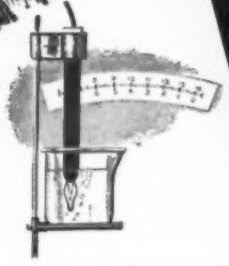
—20° to 100° C—with the new general-purpose glass. Will withstand even repeated freezing.

Now- NEW BECKMAN pH Electrodes



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And . . . *REALLY TOUGH* . . . can even be used as a stirring rod!

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WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING

Emergency Procedures and Equipment

Is a topic always of interest and value to water works operators. This well illustrated article is another by an author well known for his previous practical contributions—

SHERMAN ROGERS,
Distrib. Supt., Water Bureau, Hartford, Conn.

Chemistry of Water Treatment

Is of particular interest to water purification engineers and chemists, but this series of papers on coagulation and water softening will be read with profit by any person in the field of water supply. These fundamental articles, the first four of which have already appeared, are the contribution of—

DR. A. P. BLACK,
Head, Dept. of Chemistry, Univ. of Florida.
(President A.W.W.A.)

Installation of Low Head Pumps

Is a contribution of value to designers of low-head pumping installations. Also, the revelations in this paper, based on first hand observations of the author, reveal weaknesses which may exist in present low-head pumping installations. This worthy contribution of "Do's and Don'ts" comes from the author of the series of articles which ran in this magazine on "Hydraulics for the Practical Plant Operator"—

R. W. ANGUS, M.E.
Consulting Engineer, Toronto, Ont.

Preconditioning and Digestion of Sewage Sludge

Is being discussed in a series of articles by a well qualified author with considerable plant operating experience. The 4th in the series will appear next month. The contributor, already known to our older readers, is—

T. R. HASELTINE, Partner,
The Chester Engrs., Pittsburgh, Pa.

Repairing an Exploded Sewer

Describes the quick and inexpensive method used in the repair of a large trunk sewer ruptured by an explosion, which took out the upper half of an 84 inch sewer for a distance of 150 feet. The author—

THOMAS B. RAY,
City Engineer, New Rochelle, N.Y.

Combined Water & Sewage Plant Operation In a Small Town

Is the story of the development of a water softening plant and a sewage treatment plant under a self liquidation plan. The recounting of the operating and management problems that ensued from joint management of the utilities is presented as told to our Associate Editor by—

JOHN E. WINSKILL
Supt. Water & Sewage, Sullivan, Ill.

Fundamentals of Sewage Chlorination

Are thoroughly reviewed and new ideas are presented in this paper by—

EDW. W. MOORE,
Assoc. Prof., Harvard University.

Practical Aspects of Sewage Chlorination

Are discussed in this review by—

L. F. WARRICK,
Chief State San. Engr., Madison, Wis.

(NOTE: The above two papers constituted lectures by the authors in the Inservice Training Course, Univ. of Michigan School of Public Health.)

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155 E. 44th St., New York 17, N. Y.

H. P. GILLETTE, Pres.; E. S. GILLETTE, Vice Pres.; L. H. ENSLOW, Vice Pres.

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We shall be glad to send on request a copy of our brochure "Survival and Retirement Experience with Cast Iron Water Mains", reprinted by permission. Address Thomas F. Wolfe, Engineer, Cast Iron Pipe Research Association, 122 South Michigan Avenue, Chicago 3, Illinois.

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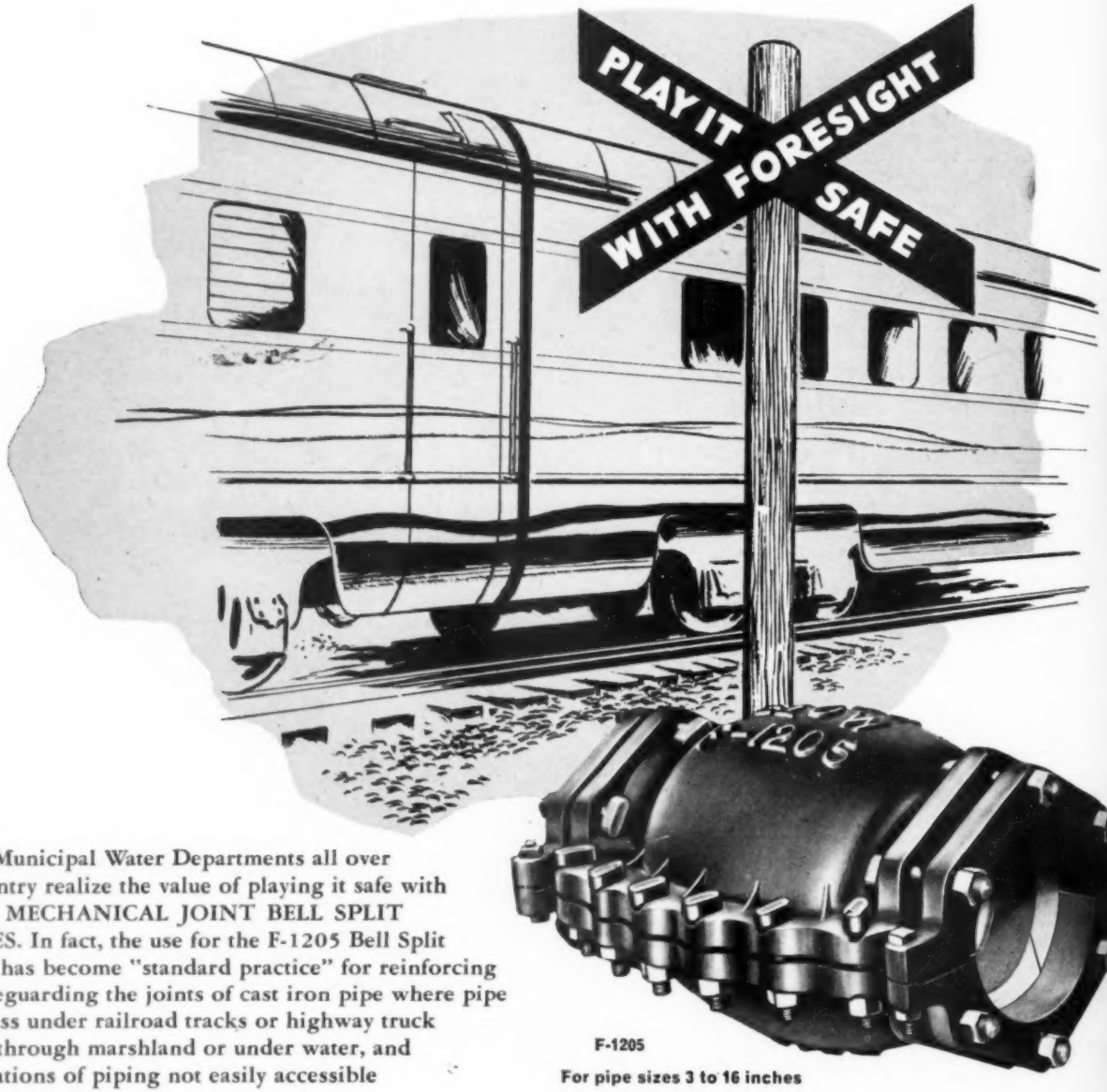

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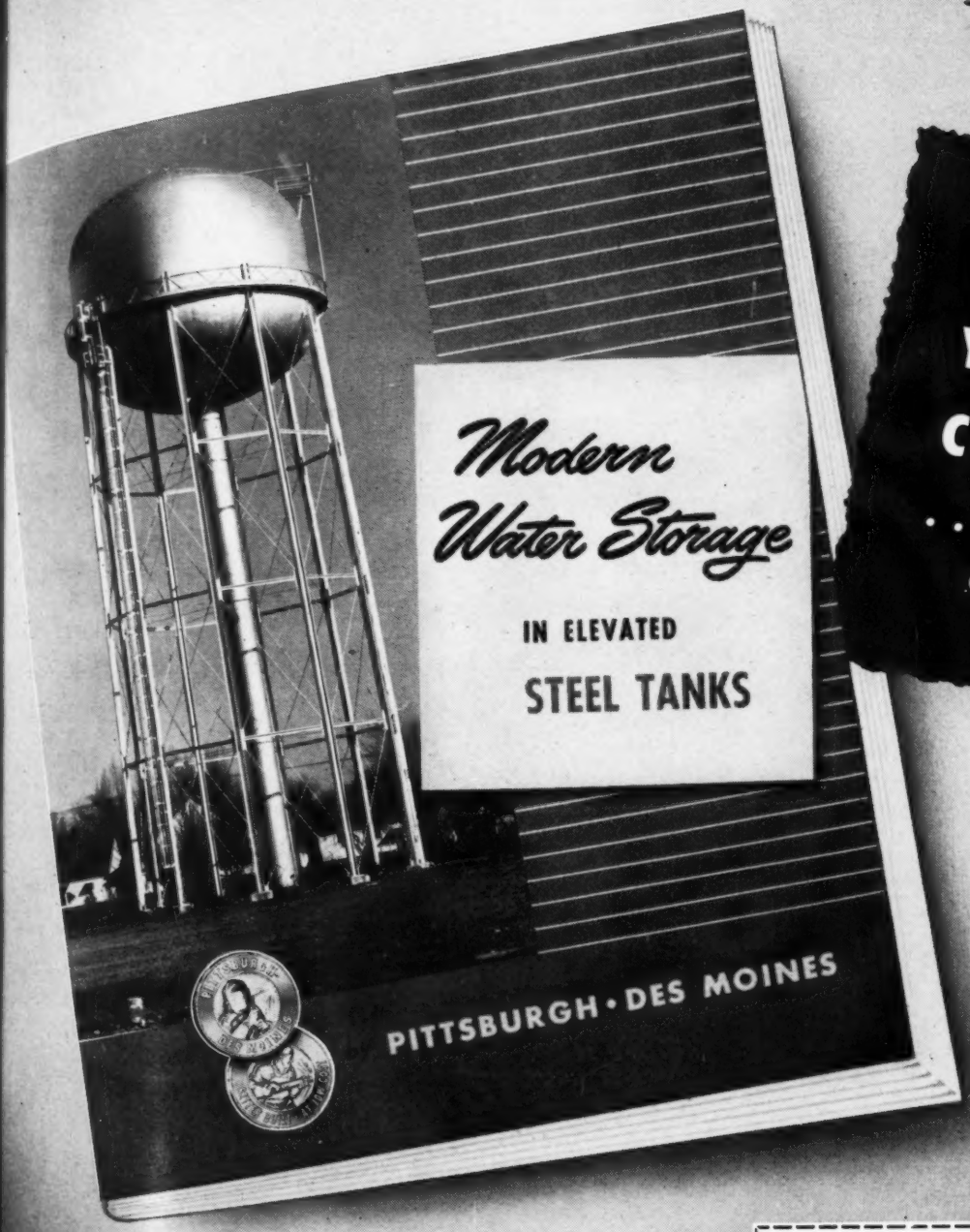

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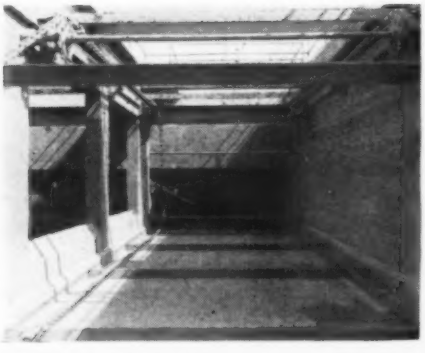

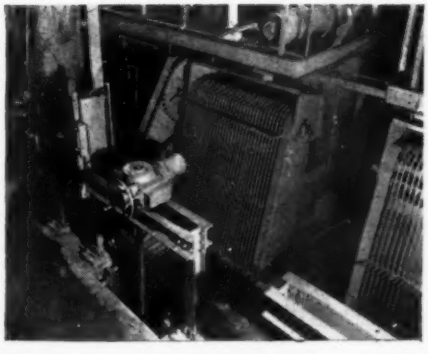

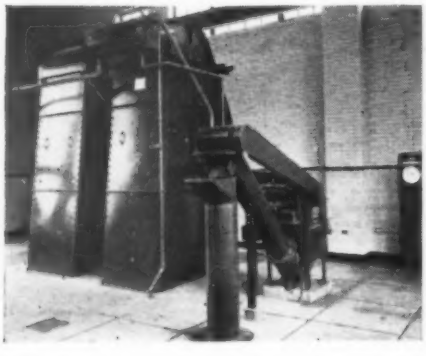

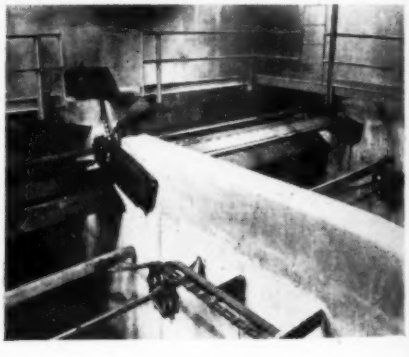

The five photos show the application of Jeffrey Screens, Collectors, Scum Removers and Grit Washers in both large and small plants. Also Sludge Elevators, Chemical Feeders, Screenings Grinders and equipment for biofiltration plants. Catalog No. 775-A goes into detail.

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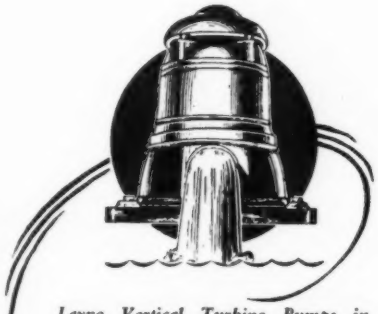

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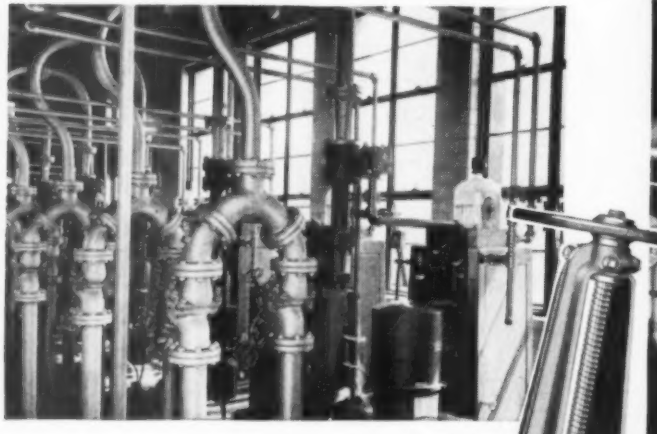
PIPING TO CHLORINATORS *in large sewage treatment plant. Valves, fittings, and pipe bends supplied by Crane.*



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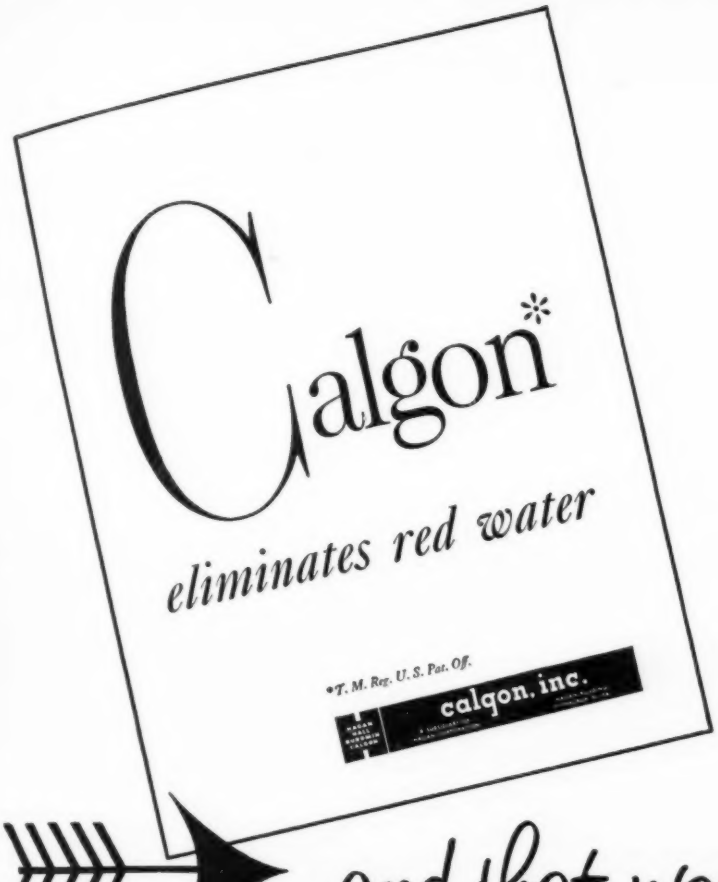

...and that was the problem at Rockford

Water from some of the wells of the Rockford, Ill. municipal system contains as much as 0.9 ppm of dissolved iron, but in Well #5 the iron runs an average of 2 ppm, which makes this well unusable.

So high a concentration of iron means certain trouble, so this well required either an iron removal plant—or Threshold Treatment with Calgon. Threshold Treatment was adopted and with complete success. With this treatment there has been no trouble with the water, no complaints from the customers, in spite of the fact that break-point chlorination is employed.

Threshold Treatment with Calgon has been so satisfactory that it has been extended to a second well, where iron concentration averages 0.8 ppm. Here again it has been entirely successful, and extension to still another well is now under consideration.

Rockford is only one of many hundred communities of all sizes where Threshold Treatment with Calgon is used to prevent scale, control corrosion, eliminate "red water" or stabilize water following lime softening.

Calgon representatives will be glad to discuss the use of Threshold Treatment in your plant.

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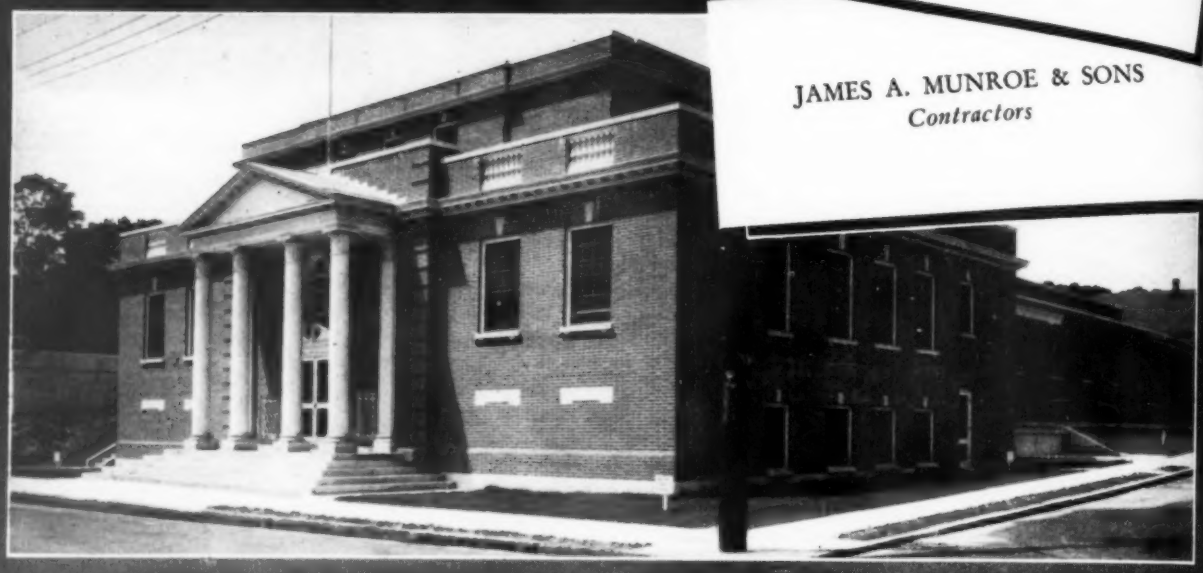

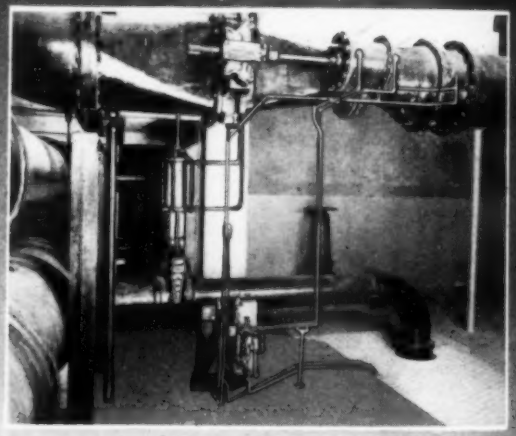

After a destructive flood in 1936, the city of Lawrence engaged the firm of Metcalf & Eddy to design a new modern filter plant. Builders Metering and Controlling Equipment, installed by James A. Munroe & Sons, has played an important part in the dependable operation of this plant. Over the last decade this plant has supplied safe water for the 85,000 people of Lawrence. For Bulletins describing Builders water works equipment, address Builders-Providence, Inc., (Division of Builders Iron Foundry), Providence 1, R. I.

Builders-Providence equipment furnished for Lawrence Water Works:

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- **24" x 10" Venturi Tube and Type M Register-Indicator-Recorder for Low Service**
- **16" x 8" Venturi Tube and Type M Register-Indicator-Recorder for High Service**

BUILDERS PROVIDENCE
Instruments

HORTON *Elevated Tank* at South Gate built to withstand earthquakes

The ease with which a Horton elevated tank can be adapted to local requirements is demonstrated by the 500,000-gal. radial-cone bottom tank shown at the left, installed at South Gate, California. To make this tank capable of withstanding earthquake shocks, special design features included sloping column and the addition of extra tie-rods. South Gate benefits too, from the radial-cone bottom design which permits the use of a large capacity tank that does not have an excessive range-inhead.

But you get more than just rugged, efficient construction when you use elevated tanks like this. Elevated storage makes it possible to pump a substantial portion of the water during off-peak periods. This generally lowers pumping costs and adds to the life of the pumping equipment. It also provides for a reserve of water for fire protection and helps maintain more uniform distribution pressures.

Once a municipality has experienced these benefits of gravity water pressure, it will turn to elevated tanks when additional water storage facilities are needed in its water system. South Gate is an example of this pattern because the tank shown supplements two existing 150,000-gal. elevated tanks.

The distribution system at South Gate serves approximately 11,265 domestic users and 375 industrial users. Average daily consumption is 6,198,000 gals. with a maximum and minimum daily consumption of 8,912,000 gals. and 3,820,000 gals. respectively.

Horton elevated water tanks are built in capacities up to 2,500,000 gals. for municipal distribution systems. They are also installed at industrial plants to meet individual plant requirements for either general water service or for providing gravity water pressure for automatic sprinkler systems. Write our nearest office for estimating figures on Horton elevated tanks.

The photo at the left shows the 500,000-gal. Horton radial-cone bottom tank in the water distribution system at South Gate, California. It is 112 ft. 9 in. to the bottom.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2181 Healey Building	Detroit 26	1551 Lafayette Building	Philadelphia 3	1644—1700 Walnut Street Building
Birmingham 1	1586 North Fiftieth Street	Houston 2	2115 National Standard Building	Salt Lake City 1	1550 First Security Bank Building
Boston 10	1048—201 Devonshire Street	Havana	402 Abreu Building	San Francisco 11	1283—22 Battery Street Building
Chicago 4	2198 McCormick Building	Los Angeles 14	1555 General Petroleum Building	Seattle 1	1350 Henry Building
Cleveland 15	2262 Guildhall Building	New York 6	3390—165 Broadway Building	Tulsa 3	1646 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

9 California East Bay Cities Served By Allis-Chalmers

NEW BOOSTER PUMPING STATION IS EQUIPPED WITH A-C SWITCHGEAR, CONTROL PANELS, TRANSFORMERS AND MOTORS

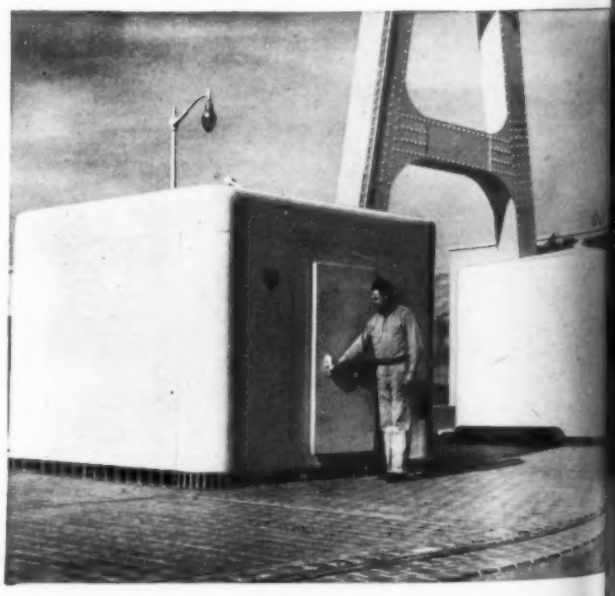
WITHIN EIGHT YEARS, water consumption in the East Bay Municipal Utilities District has increased 134 percent. To meet this rising demand a new booster pumping station was constructed on the 94 mile Mokelumne Aqueduct. Combined with older facilities, this new station more than meets the water demands of the district.

The electrical system of the new station is Allis-Chalmers equipped. A-C equipment here includes a bank of 2000 kva transformers, outdoor metal-clad switchgear, two 4000 hp vertical motors, and a panel and benchboard for the control room. Installed in 1945, this equipment has given efficient, reliable service.

This A-C equipped station is typical of what Allis-Chalmers can do and has done for all size cities—large, medium and small. When your community plans improvements, take advantage of Allis-Chalmers specialized knowledge in building the world's widest range of public works equipment. For more information write for bulletin 25B6607, "Public Works Equipment." A-2777

ALLIS-CHALMERS, 1192A SO. 70 ST.
MILWAUKEE, WIS.

BANK of Allis-Chalmers single phase, 2000 kva power transformers at new pumping station of East Bay District. Units are equipped with no-load tap changers, side mounted for easy, simple changes. Transformers are also designed with *Oil-Sealed* inert gas systems which seal off cooling oil from outside air. This reduces contamination of cooling oil and prevents deterioration.

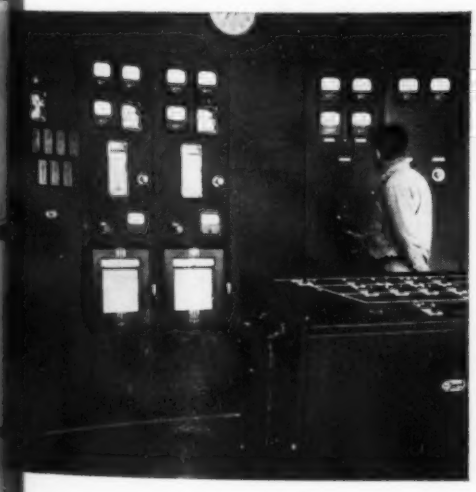


4000 HP, 900 RPM vertical motors drive centrifugal pumps. These motors were assembled at the site and enclosed in special weatherproof housings to insure safe outdoor operation. Motors and streamline housings were built by A-C.

Ruptair and *Oil-Sealed* are Allis-Chalmers trademarks.

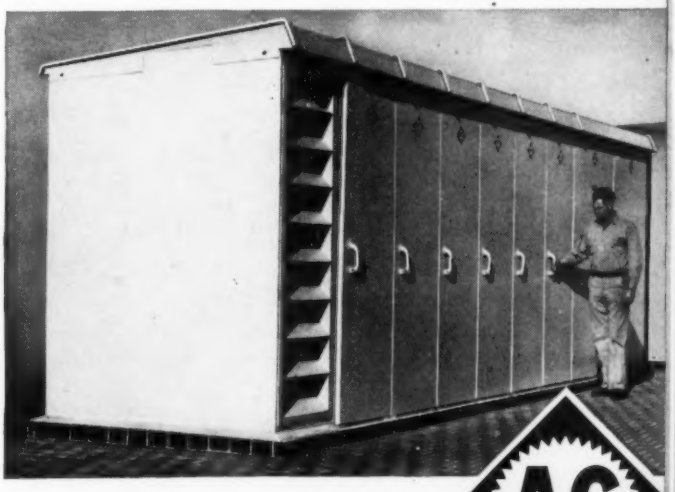
AREA SERVED by the East Bay Municipal Utility District includes Alameda, Albany, Berkeley, El Cerrito, Emeryville, Oakland, Piedmont, Richmond and San Leandro. Total area: 187 sq miles with a population of nearly one million. A portion of this area is shown above with Oakland-San Francisco Bay Bridge in the foreground.

Photo by Commercial & Photo View Company, Oakland, Cal.



MODERN type control switchboard and benchboard were designed by Allis-Chalmers to provide this station with reliably accurate automatic remote control.

PROTECTION for two 4000 hp motors is provided by outdoor metal-clad switchgear with *Ruptair* magnetic air circuit breakers rated 100,000 kva interrupting capacity.



ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Builders of the World's Widest Range of Public Works Equipment

MORE EFFECTIVE PRIMARY TREATMENT

WITH P.F.T. *Pre-Aeration*

P.F.T. Pre-aeration Equipment at inlet end of primary settling tank, at Stockton Calif., Sewage Treatment Plant. Clyde C. Kennedy, Consulting Engineer.

Pre-aeration and primary settling now can be effectively combined in the primary settling tank by the installation of P.F.T. Pre-aeration Equipment at the inlet end of rectangular tanks.

This equipment consists of standard porous diffuser plates in vertical cast iron holders, arranged for easy removal and servicing of plates. Air introduced to the raw sewage, through these plates, adds oxygen, provides agitation and mixing. This triple action provides three essentials:

1. Elimination of septicity.
2. Conditioning of solids for improved settling.
3. Increased removal of suspended solids and 5-day B.O.D.

A baffle separates the pre-aeration and sedimentation portion of the primary tank. A single sludge removal mechanism can be used to serve both sections of the tank—a further economy.

Installations of P.F.T. Pre-aeration Equipment are giving highly satisfactory performance. Write for further information and list of installations.

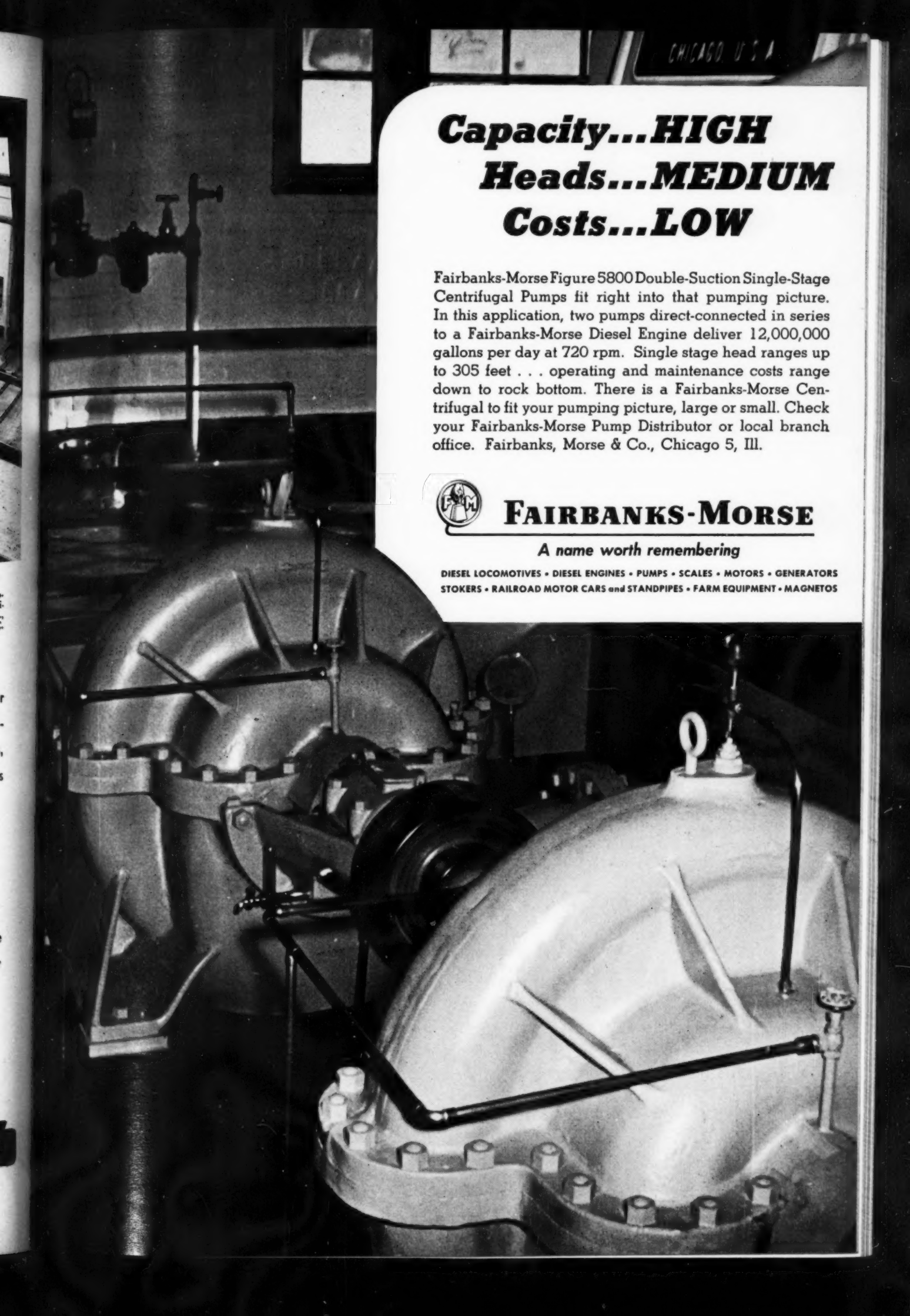
P.F.T.

PACIFIC FLUSH TANK CO.

SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

4241 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

NEW YORK ● LOS ANGELES ● SAN FRANCISCO ● CHARLOTTE, N. C. ● DENVER ● TORONTO



Capacity...HIGH Heads...MEDIUM Costs...LOW

Fairbanks-Morse Figure 5800 Double-Suction Single-Stage Centrifugal Pumps fit right into that pumping picture. In this application, two pumps direct-connected in series to a Fairbanks-Morse Diesel Engine deliver 12,000,000 gallons per day at 720 rpm. Single stage head ranges up to 305 feet . . . operating and maintenance costs range down to rock bottom. There is a Fairbanks-Morse Centrifugal to fit your pumping picture, large or small. Check your Fairbanks-Morse Pump Distributor or local branch office. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

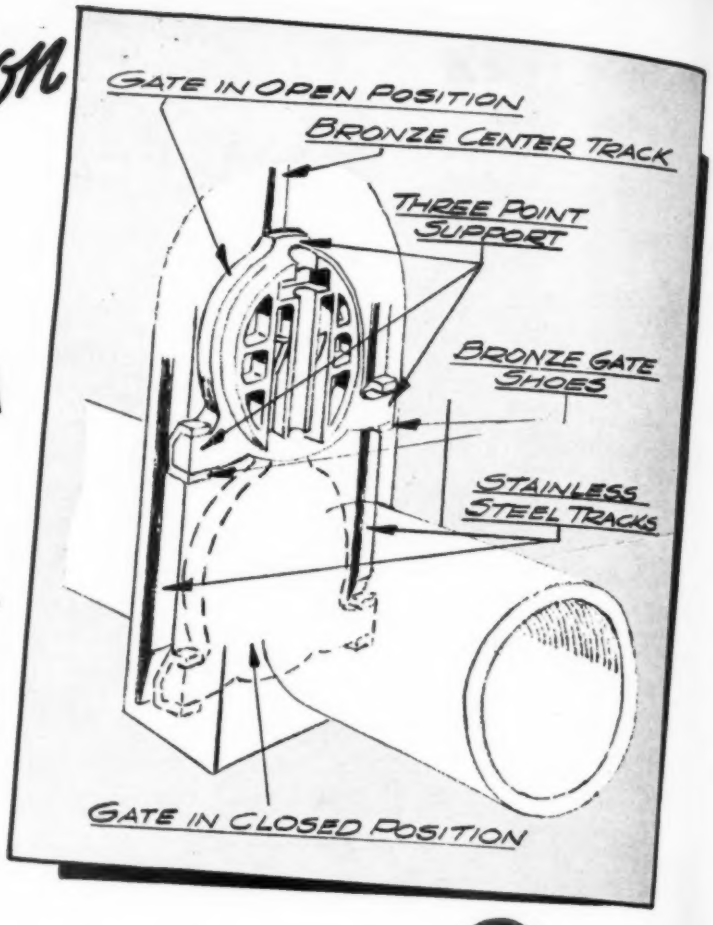
A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

FOR *Positive Operation*

RENSSELAER

SQUARE BOTTOM GATE VALVES *have 3-point gate support* moving on STAINLESS STEEL TRACKS

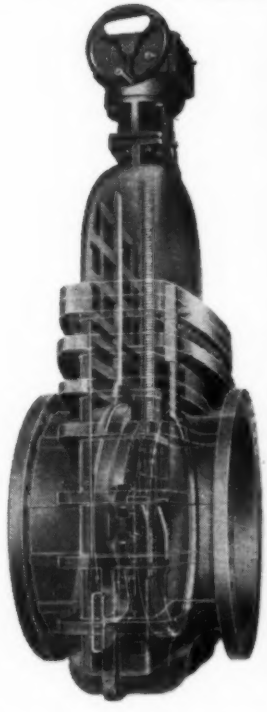


Designed for longer life under severe operating conditions, this was the pioneer valve supporting the downstream gate in THREE places at EVERY point in its travel. In its full length of travel this gate is smoothly guided by the lower supporting lugs sliding on STAINLESS STEEL TRACKS. The center track, for the top lug, is bronze.

- This constant three-point support means eliminating any tendency of the gates to tilt when partly open and score or wear the face of the seat ring.
- Another feature—during entire operation, the gate ring is held completely free from contact with the seat ring, by the tracks, until near the closing point. Then the tracks taper and allow contact between gate and seat, minimizing wear.

Recommended for emergency shutoff, frequent operation, throttling service and vertical pipe lines.

- *Without obligation on your part, a Rensselaer representative will be glad to give you the benefit of his experience in Valves, Hydrants and other Rensselaer products. Call our nearest office.*



WHAT 3-POINT SUPPORT MEANS

1—*Valve closes easily under high differential head.*
2—*Valve operates frequently without excessive wear.*
3—*Valve can be used for throttling without damaging seat rings.*
4—*The gates are properly supported for operating in vertical lines.*

VALVES & HYDRANTS IN STOCK
ATLANTA
CHICAGO
KANSAS CITY
LOS ANGELES

LEADERSHIP FOR OVER 65 YEARS

RENSSELAER

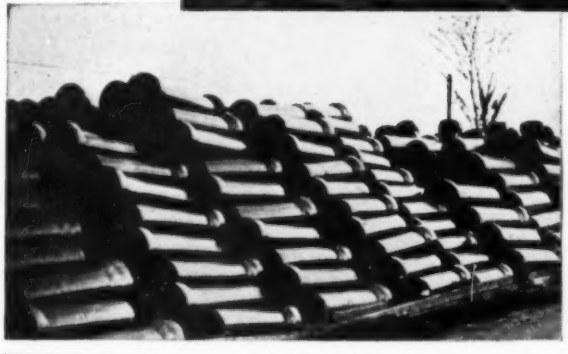
Gate Valves • Square Bottom Valves • Tapping Valves and Sleeves
Hydrants • Check Valves • Air Release Valves

RENSSELAER VALVE COMPANY • TROY, N. Y.

Division of Neptune Meter Company

Atlanta, Bala-Cynwyd, Pa., Chicago, Denver, Haverhill, Mass., Hornell, N. Y., Kansas City, Los Angeles, Memphis, Oklahoma City, Pittsburgh, San Francisco, Seattle, Waco

Colorful Baton Rouge is spending six million dollars to make its sewer system as modern as the city it serves. Vitrified Clay Pipe has been specified for this huge project. 250 miles of new sewers, using clay pipe up to 36", are going in. This includes 10,000 house connections, most of which are 4" and 6" Clay Pipe. Three contractors on this huge project are Sullivan, Long and Hagerty of Bessemer and Birmingham, Ala.; E. L. Dalton & Co. of Dallas, Texas; Forcum-James & Co. of Baton Rouge and Dyersburg, Tenn.



BATON ROUGE
USES CLAY PIPE FOR $6,000,000 SEWER PROJECT

Clay Pipe is Vitrified to Last for Centuries

CLAY PIPE'S raw material, clay, is chemically-inert and acid-resistant by nature. When it is formed into pipe and vitrified at fusing temperatures, it becomes a strong, cohesive pipe that *can't* disintegrate . . . that delivers centuries of trouble-free service. Clay Pipe is the *only* pipe that lasts forever under *any* sewerage or drainage conditions.

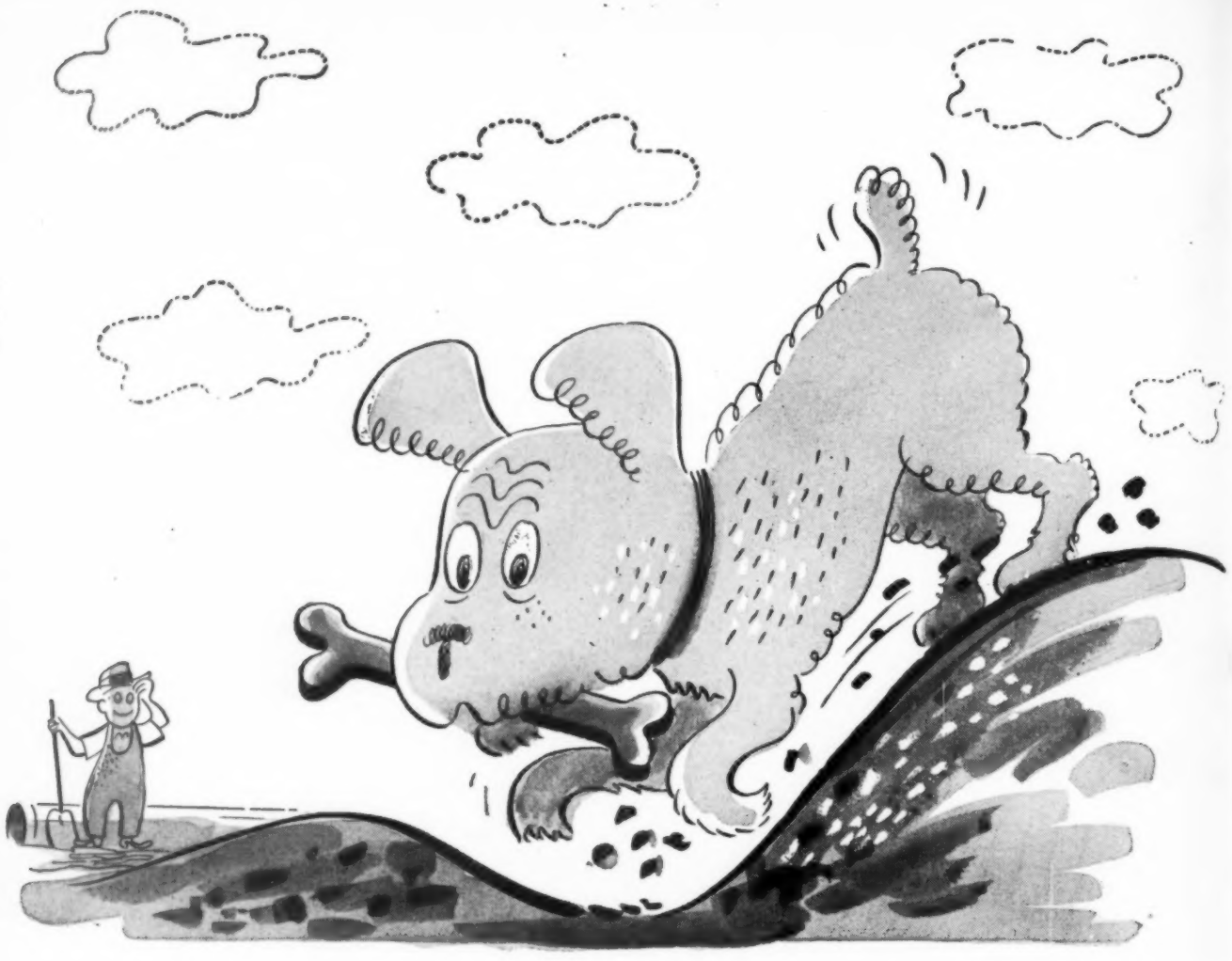
If you need specific information on a Clay Pipe question, write to the office nearest you.

Vitrified
CLAY PIPE

National Clay Pipe Manufacturers, Inc.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
522 First National Bank Bldg., Atlanta 3, Ga.
703 Ninth and Hill Bldg., Los Angeles 15, Calif.
1105 Huntington Bank Bldg., Columbus 15, Ohio

CLAY PIPE NEVER WEARS OUT!

C-449-1



Lower Excavation Costs

Substantial savings in excavation costs are often possible with Transite* Sewer Pipe because of its high flow capacity. This often permits the use of flatter grades and shallower trenches. This is a particularly important advantage where the pipe must be laid at or below the ground water line or where rock excavation is involved.

As an alternate economy, designers may take advantage of Transite's high flow capacity by specifying smaller diameter pipe.

Other Transite Economies

Transite's long 13-foot lengths and light weight lower handling costs. And because there are fewer joints to assemble in the finished line, installation is faster, and more economical.

As a further economy, Transite's sleeve-type joints guard effectively against infiltration. This helps reduce the load on the treatment plant. Therefore, treatment costs are kept to a minimum—plant capacity is conserved for the increased loads incident to community growth.

Made of asbestos, cement and silica combined into a homogeneous material of great stability, Transite Sewer Pipe is corrosion-resistant both inside and outside. Tight joints safeguard against root trouble. And every Transite length is factory-tested for strength and uniformity. This adds up to low maintenance costs through the years.

For all the facts about Transite, send for brochure TR-21A. Address Johns-Manville, Box 290, New York 16, N. Y.

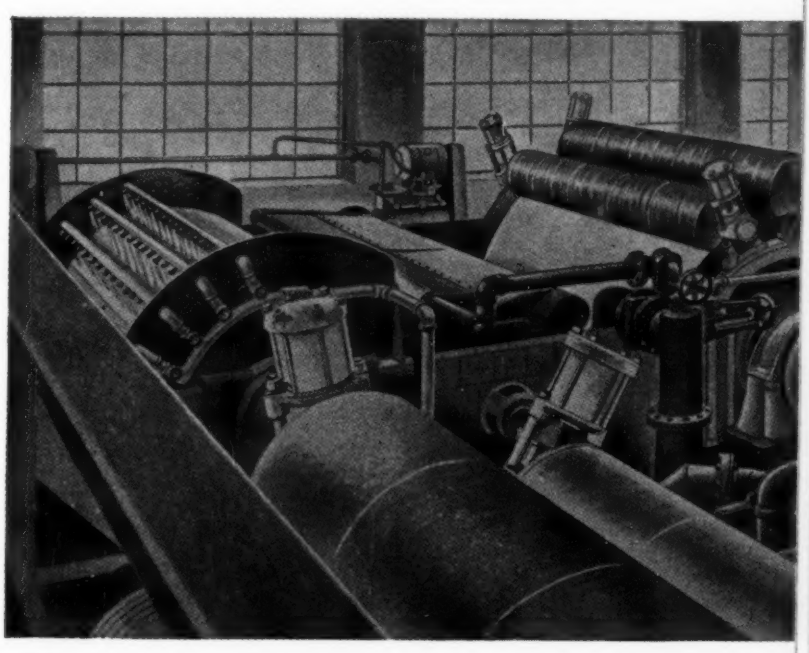
*Transite is a Johns-Manville registered trade mark

.....Johns-Manville

TRANSITE SEWER PIPE...

as you were in 1900

Paper bleaching was a slow and uncertain process at the turn of the century



as you are today

Bleaching with liquid chlorine in a modern mill is fast, efficient, precise

...with pioneering aid from Niagara Alkali

An old industry with young and progressive ideas, the paper industry has made tremendous strides forward since 1900—in the speed and efficiency of its methods and the quality, variety and utility of its products.

Niagara's pioneer production in America of liquid chlorine and caustic soda helped to make such advances possible in the paper industry—and in the textile, soap, glass and other fields. For pioneer quality and service in electro-chemical products look to Niagara.

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Liquid Chlorine • Caustic Potash • Carbonate of Potash • Paradichlorobenzene • Caustic Soda • NIALK TRICHLORethylene

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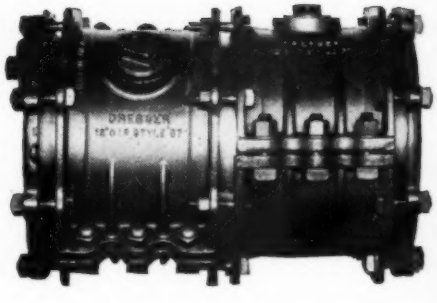
quick, *permanent* repairs w
"Adjustable" Repair Sleeve, Style 82. Re
less of weather, one man, using only a wrench, can repair a break or split in a matter of minutes. Interchangeable sections make these "pre-packed" repair sleeves adjustable to exact fit on all classes of AWWA pipe, and the specially compounded rubber gaskets introduce flexibility into your line.

The *low price* of the Style 82 offers genuine economy. Order now—to be sure you have a supply on hand for emergency repairs this winter. For CIP from 4″ to 8″ in diameter.



FOR LONGER SPLITS, LARGER SIZES

Dresser Split Sleeve, Style 57C, used singly or in combination (as shown above), encloses breaks, holes, splits in CIP longer than the Style 82 will accommodate. Available in sizes through 12″.

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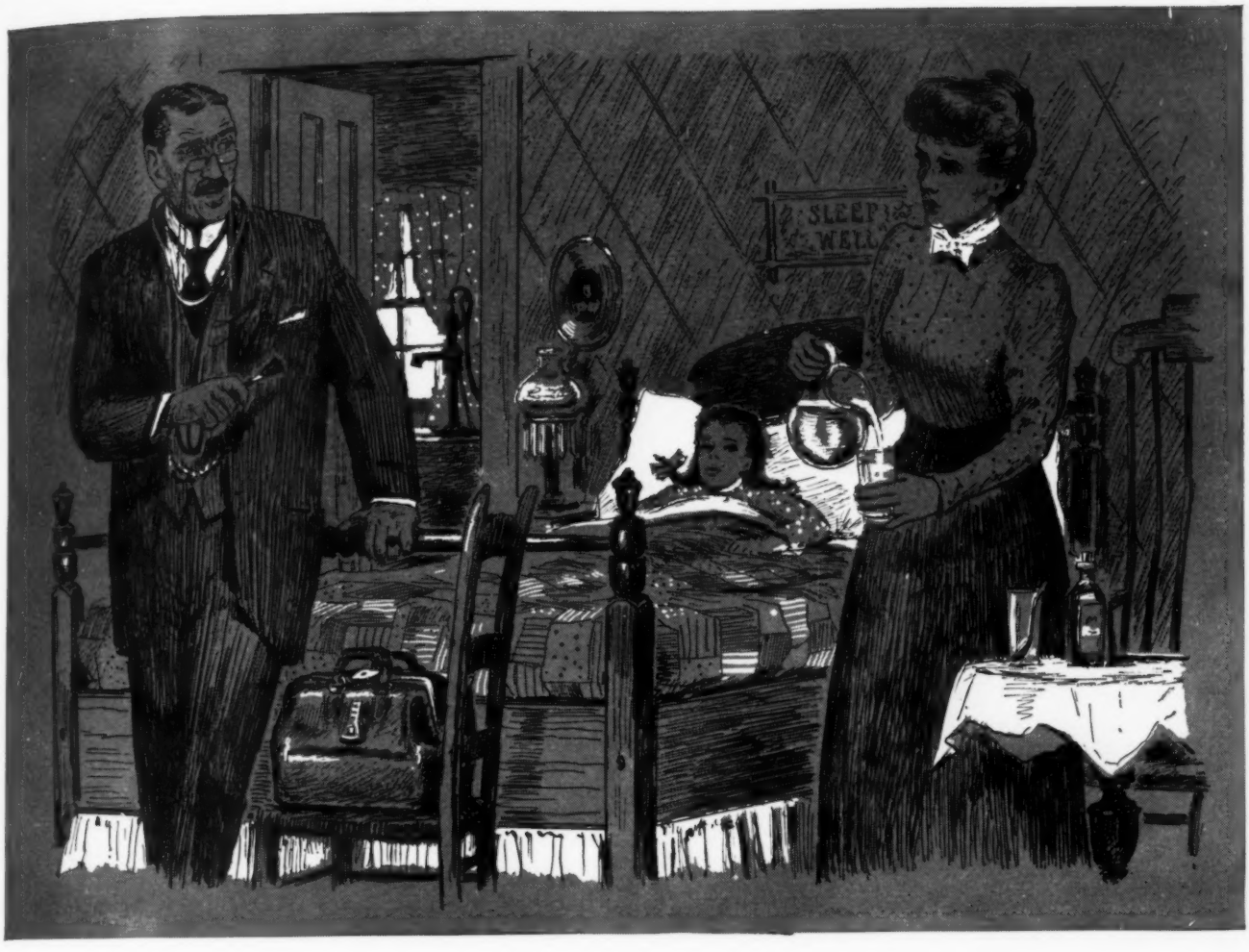
In Canada: Dresser Manufacturing Co., Ltd., Toronto • Sales Offices: New York, Chicago, Houston, San Francisco



"Maybe it's the water, Mary, better boil it."

The virtual banishment of typhoid and other water-borne diseases, within the past 50 years, must be largely credited to those men responsible for the design, construction and operation of water supply systems. Modern water purification processes had their beginning only a few years before our Company was established in 1899. Today, (where necessary to make it safe), water is processed by over 5,000 of the more than 12,000 public water supply systems serving 85 million Americans.

The growth and progress of the gas industry and sanitation service during the past half-century has been equally remarkable. Today, over 20 million families use gas for cooking, refrigeration and space and water heating. More than half of our urban population is now served by 6,000 sewage treatment plants.

For 50 years, our Company has contributed to the growth and progress of these public services by providing cast iron pressure pipe for water, gas and sewer mains, and for water purification and sewage treatment plants. We have matched their progress with a half-century of progress of our own in manufacturing methods, production standards, quality controls and facilities for research and development.

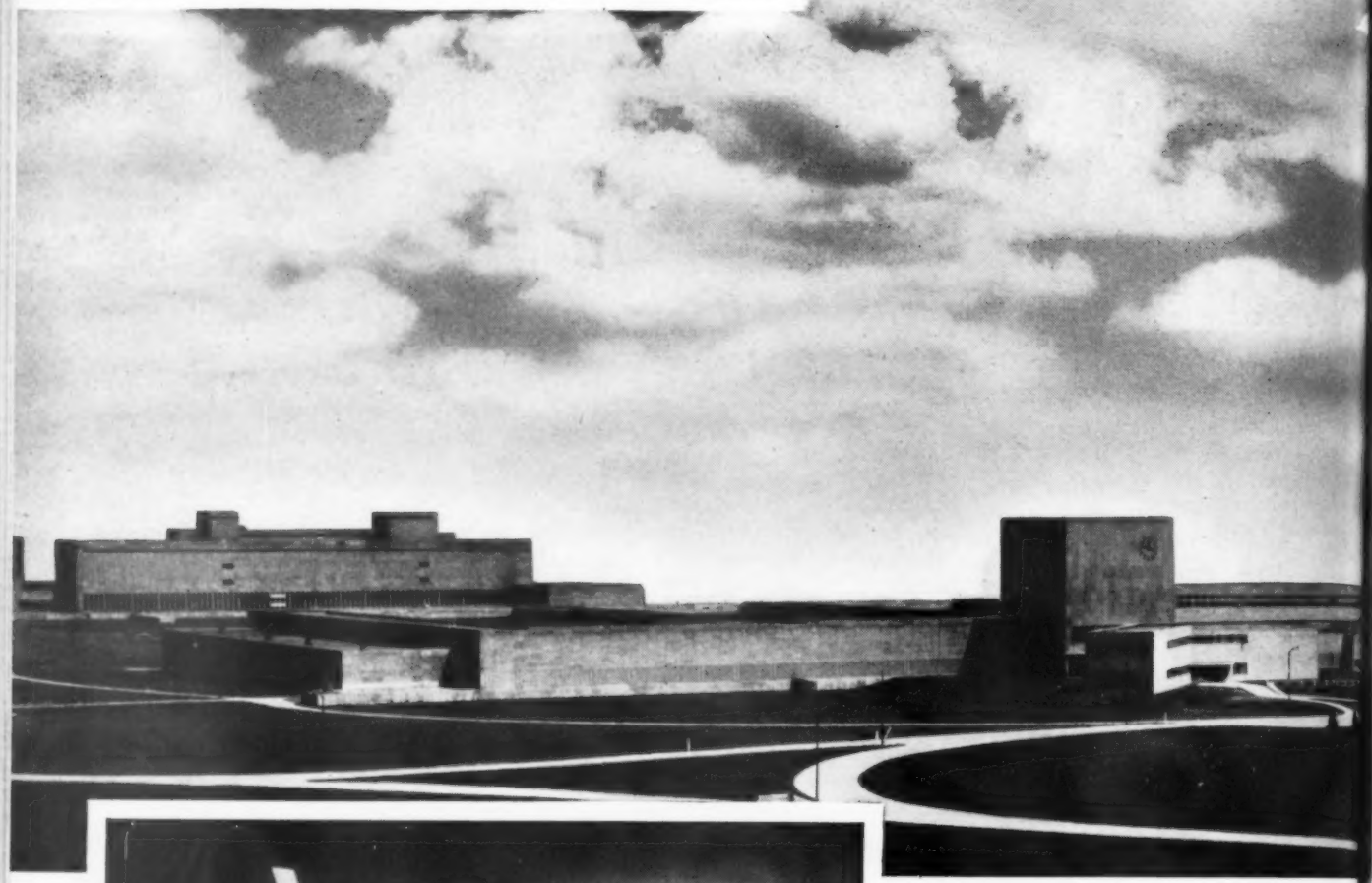
To those responsible for the great progress in water supply, gas and sanitation service and their contribution to better health and living over the past fifty years, America pays tribute.

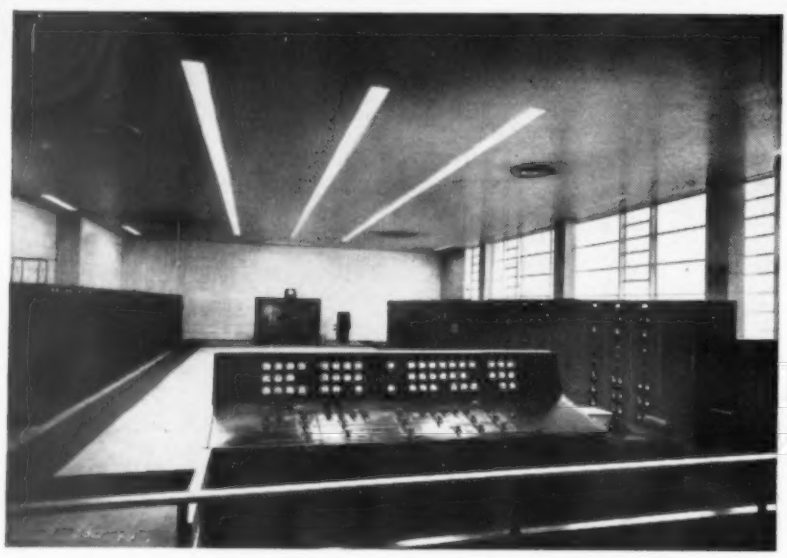
U.S. CAST IRON PIPE

1899-1949
U. S. Pipe & Foundry Co.
Makers for 50 years of cast iron pipe for water, gas and sewerage service.
General Offices: Burlington, N. J.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





The Chicago South District Filtration Plant shown here is the largest in the world, serving more than a million and a half people. The plant has operated at an hourly peak of 546 mgd with only 70 of the 80 filters in service.

This mezzanine switchgear room in the lower left pumping station is an example of the way Westinghouse designs and manufactures electrical equipment for a co-ordinated, efficient system. (Right) High-voltage switchgear gives necessary protection on incoming lines as well as feeders, and supplies power to large pump motors and station transformers. (Left) Low-voltage switchgear controls station auxiliaries such as priming pumps, crane motors, feeder and valves. (Rear center) Network protectors and 120/208-volt distribution for building lighting and miscellaneous power. (Front center) Control desk with mimic bus, indicating instruments and circuit breaker switches centralizes control of plant equipment.

Westinghouse

EQUIPMENT FOR PUBLIC WORKS

Unit Responsibility

ASSURES WATER WORKS EFFICIENCY

For any water works, large or small, higher operating efficiency depends in part on your electrical manufacturer.

He should provide every type of electrical equipment . . . give you a co-ordinated engineering application . . . based on practical experience in water works electrification.

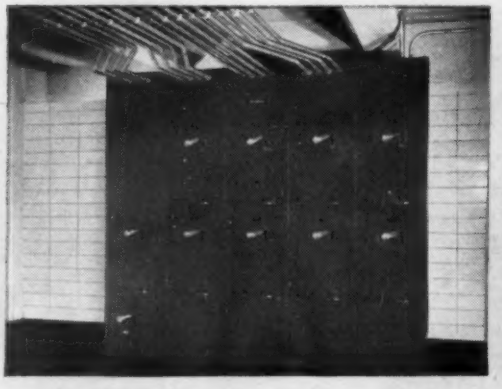
These elements add up to unit responsibility and mean reduced operating costs for your plant. You get them all from Westinghouse:

Westinghouse makes a complete line of electrical equipment for water works. This includes "Unitized" metal-clad switchgear; packaged power centers, power transformers and unit substations; control and control centers; motors and gearmotors, as well as other electrical apparatus and supplies.

Westinghouse Consulting and Application Engineers are available to work with you. They will help you select and apply the right equipment to give you a co-ordinated, efficient electrical system.

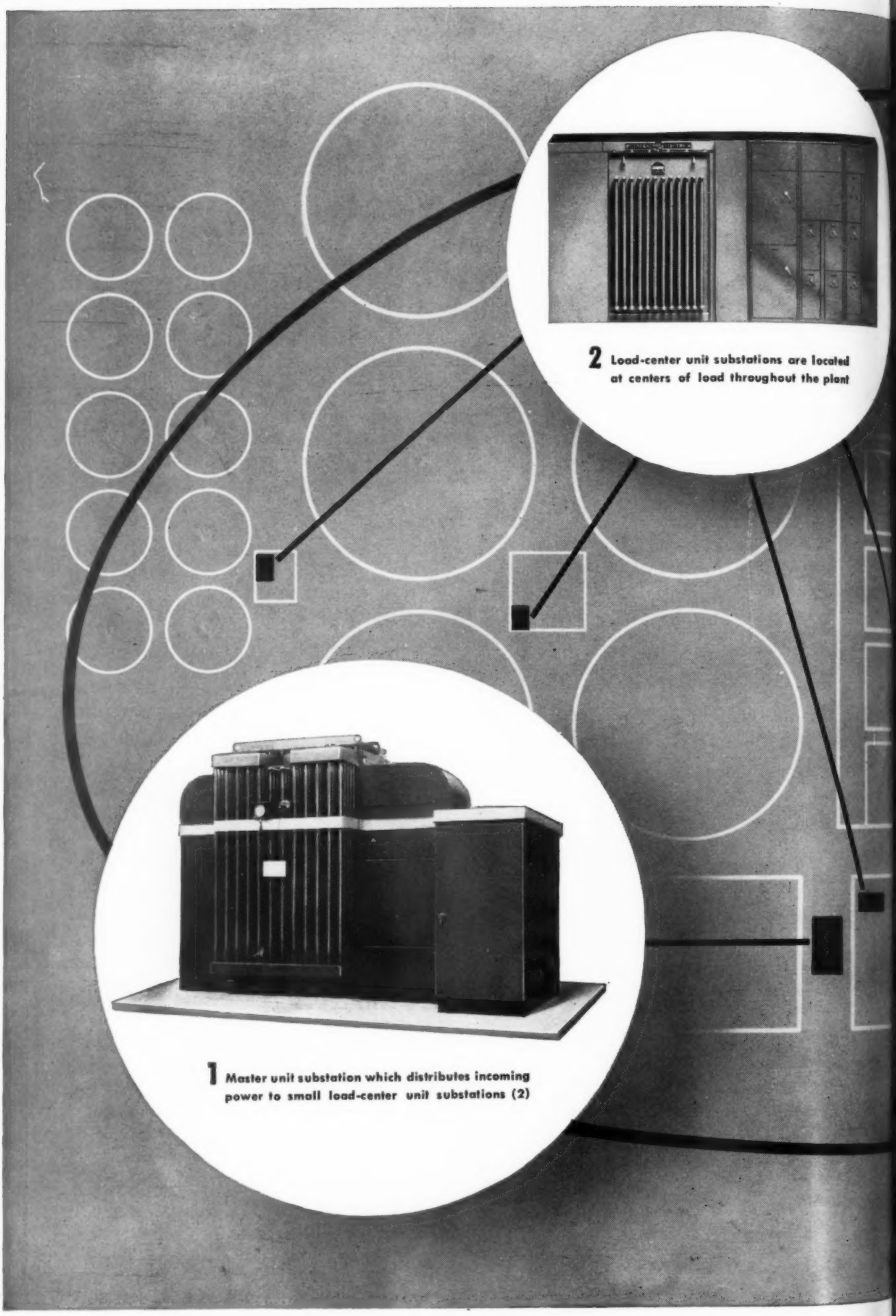
Westinghouse brings you a background of long experience in applying electrical equipment to water works. The Chicago South District Filtration Plant, shown here, is but one more in a large list of outstanding installations where Westinghouse unit responsibility has been *proved* on the job.

For help on your water works electrification problems, call your nearest Westinghouse District Office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94818



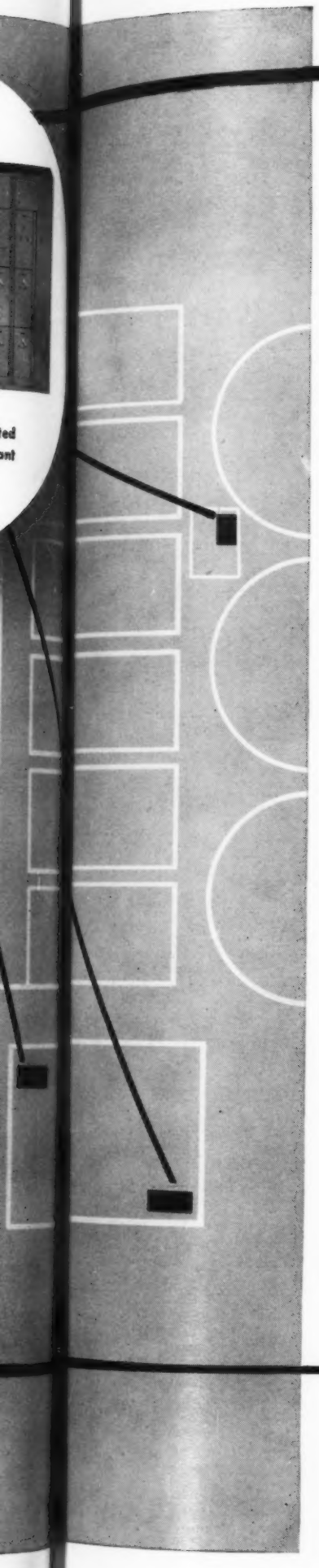
This control center on the third floor of the Chemical Building groups into one unit all the combination linestarters and motor control for fan motors, agitator drives and other auxiliary equipment in this plant area.

These two 300-kva, 3-phase, 60-cycle, 2300/120-208-volt, liquid-filled distribution transformers are located in the west pump room and supply power for the building lights and equipment in the Filtration Plant.



2 Load-center unit substations are located at centers of load throughout the plant

1 Master unit substation which distributes incoming power to small load-center unit substations (2)



Specify LOAD-CENTER Power Distribution!

This modern technique offers more protection for men and equipme.. saves space, keeps utilization voltage normal, simplifies maintenance, increases operating efficiency, streamlines plant appearance—ALL AT LOWER INSTALLED COST

Load-Center Power Distribution—the system which distributes incoming power at 2400 or 4160 volts from a master unit substation (1) to small load-center unit substations (2) located near the centers of electrical load—has received quick acceptance in the water and sewage fields because it offers these advantages over previous systems:

SAFETY— Metal enclosures house in one unit the transformer, switchgear or control, and interconnections; no exposed buses or bushings to create a hazard.

LESS SPACE— Unit substations take less space than an assortment of components because they are designed as a unit, interconnections are short.

EASY INSTALLATION AND MAINTENANCE— Unit substations are factory-assembled and tested, ready for immediate installation. Their enclosures protect against dirt and foreign particles, yet doors allow ready access to compartments for inspection.

HIGH EFFICIENCY— By locating unit substations near the centers of electrical load throughout the plant, secondary feeders are kept short, power loss low. Load voltage stays up.

ATTRACTIVE APPEARANCE— Unit substations streamline your water or sewage plant because they enclose all power distribution equipment in one attractive metal enclosure. Cable connections may be made underground to eliminate unsightly overhead wires and poles. The small substations at the load centers may be combined with G-E Cabinetrol to give a compact, attractive distribution and control center.

You get all these features at LOWER INSTALLED COST than if you purchased the components separately! Your consulting engineer or General Electric representative will tell you more about Load-Center Power Distribution, and help you plan your entire electrical layout. Call today, or write for Bulletin GEA-3785, "Load-Center Power Distribution." *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

CO-ORDINATED WATER-PLANT . . . SEWAGE-PLANT ELECTRIFICATION

GENERAL ELECTRIC

"Every individual connected with water purification or sewage works should subscribe to this publication. I have introduced it to a host of friends in this field"

Testimonials such as this from subscribers to WATER & SEWAGE WORKS really tell the story. The man who reads and uses the magazine as an aid in his work knows how much it will benefit other workers in the field.

The great REFERENCE & DATA issue alone is worth more than the yearly subscription rate. In it you will find formulae, charts and illustrations covering information not obtainable in any other one source.

Supply of 1949 REFERENCE & DATA number is limited. If you are not a subscriber send your order today!

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You may enter my order for 1 yr. @ $2.00 ☐
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(Add $1.00 per year for foreign postage)

- *If you are interested in the water field only you get all the authoritative data on this subject.*
- *If you are interested in sewage problems only you are kept fully informed and given much help in this field.*
- *If you are interested in both subjects you get all the information in this one monthly magazine.*

Badger Meters solve city's water supply and financial problems

This city's demands for water were expanding. Two wells and the pumping facilities appeared inadequate. No overhead reservoir was available. Financing a third well and pumps was impractical. Water wastage (before installing Badger Meters) seemed excessive. The city decided to try metering as a means of reducing waste. Result: after metering, 24-hour flow was reduced over 55%. No new well needed. The water supply problem was solved . . . so was the financing problem! You, too, will find "It pays to BUY BADGER".

NEW! Badger Chart No. 695 (Practical plan for a small meter repair shop). WRITE today for this chart — no charge or obligation.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.

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NEW YORK CITY • PHILADELPHIA • WORCESTER, MASS. SAVANNAH, GA. • CINCINNATI • CHICAGO • KANSAS CITY, MO. • WACO, TEXAS • SALT LAKE CITY, UTAH PORTLAND, ORE. • SEATTLE, WASH. • LOS ANGELES

You will find a Badger Meter size and type for every waterworks service. Shown here are Model SC-IOT (for warm climates), and Model A-IOT (for cold climates) . . . sizes 5/8" to 1¼" . . . other models in sizes up to 12". Write for complete information and prices.

BADGER Water METERS

ACCURACY • LOW-COST MAINTENANCE • DURABILITY • SENSITIVENESS

Standardize on

TRIDENT

INTERCHANGEABILITY

FOR TRUE STANDARDIZATION...

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Instead of an accumulation of old gear trains for old meters . . . you just pick any new Trident Gear Train. It fits perfectly into any Trident Meter, new or old. Gear trains for ⅝", ¾" and 1" Tridents are identical, interchangeable.

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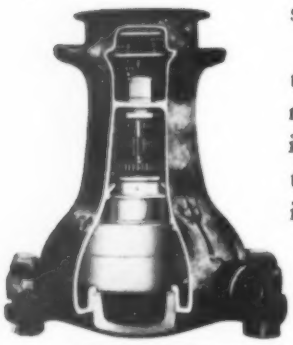

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WATER & SEWAGE WORKS

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A Gillette Publication

SPORICIDAL PROPERTIES OF CHLORINE DIOXIDE

by

G. M. RIDENOUR[1], R. S. INGOLS[2], E. H. ARMBRUSTER[3]

UNIVERSITY OF MICHIGAN*
ANN ARBOR, MICH.

PREVIOUS studies[1][2][3] have shown that chlorine dioxide possesses both bactericidal and virucidal properties as measured against E. coli, common water pathogens and mouse adapted poliomyelitis virus. In the aforementioned studies chlorine dioxide gave results comparable with chlorine on an OTA basis of residual measurement. The non-spore forming bacteria are of first importance since they include the principal etiological agents of water borne disease. However, spore forming organisms are also a source of annoyance in water supplies by providing inoculation for after-growths in water distribution systems.

The investigations have hence been extended to collect information on the sporicidal properties of chlorine dioxide in relation to both free chlorine and chloramines, as a complement to the information on the non-spore forming bacteria and virus.

METHODS OF STUDY

Information on the sporicidal properties of chlorine dioxide, in relation to free chlorine and chloramines, was sought with the use of the spore forming bacteria, B. subtilis, B. megatherium, and B. mesentericus. The sporicidal effect of chlorine dioxide was compared to that of "free chlorine" from two sources; one (Method A), the "free chlorine" from an ammonia bearing spore suspension chlorinated beyond the breakpoint, the other (Method B), from gaseous chlorine solution added directly as

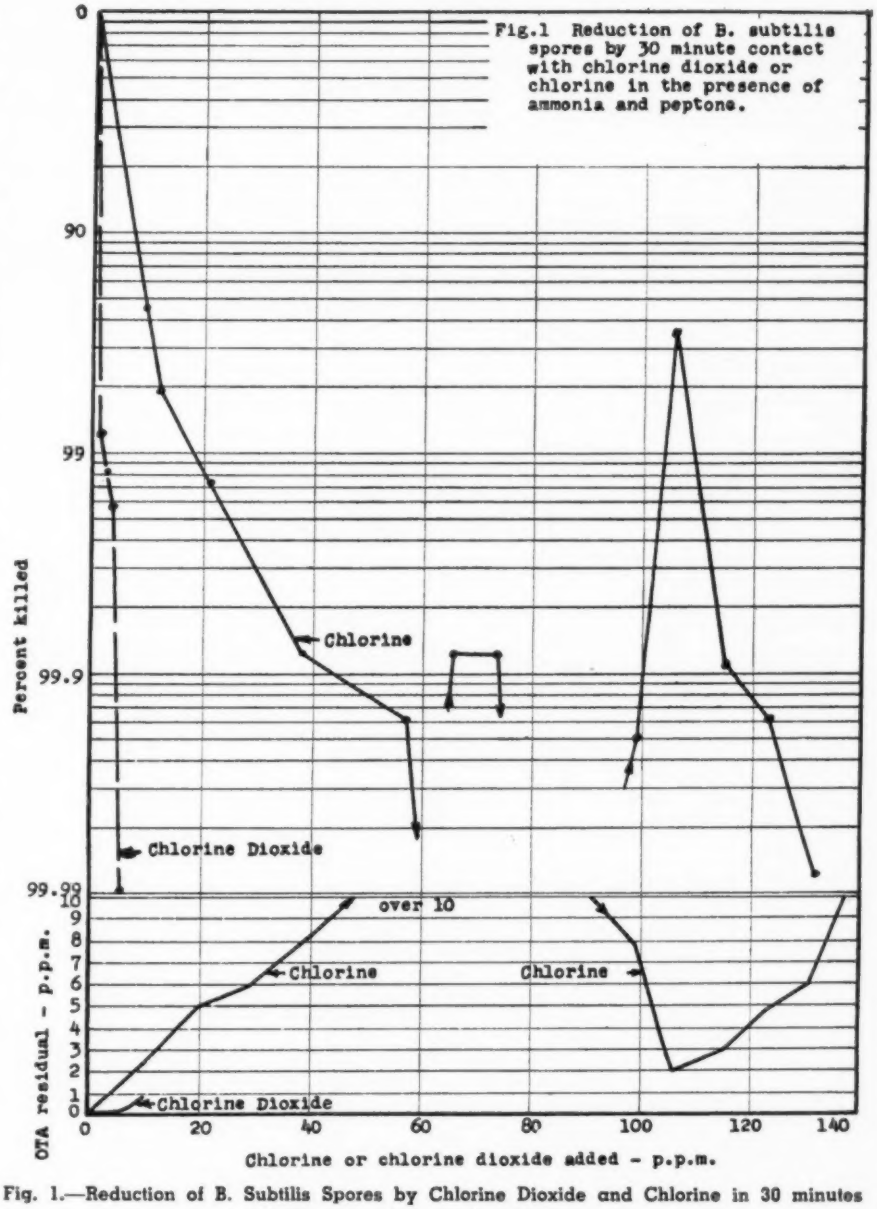

Fig. 1.—Reduction of B. Subtilis Spores by Chlorine Dioxide and Chlorine in 30 minutes *(In presence of ammonia and peptone)*

*School of Public Health
(1) Assoc. Professor, (2) Instructor, now Assoc. Research Professor, School of Civil Engineering, Georgia Institute of Technology, Atlanta, Ga., and (3) Research Associate.

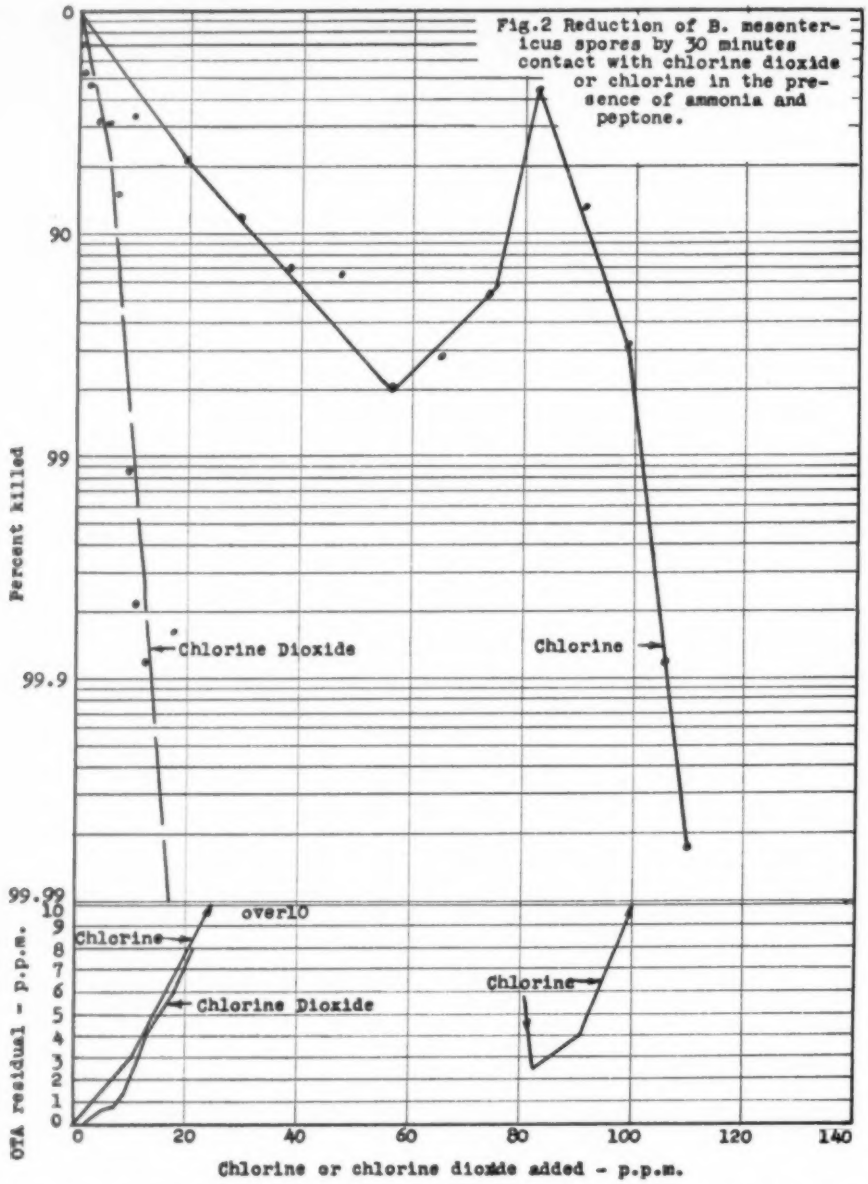

Fig. 2.—Reduction of B. Mesentericus Spores by Chlorine Dioxide and Chlorine in 30 minutes
(In presence of ammonia and peptone)

"free chlorine" to an ammonia free and organic free spore suspension.

The chlorine dioxide gas was prepared by scrubbing out acid treated sodium chlorite into water. This was used as the working stock solution. Chlorine was similarly prepared, except that sodium hypochlorite was used for generating the chlorine gas. Chloramines were obtained by adding chlorine to the working spore suspension that contained ammonia.

All working solutions were buffered to maintain a pH between 7.0 and 7.5. Chemical measurements of the disinfectants were made by means of iodide starch titration, acid orthotolidine (OT) and orthotolidine-arsenite (OTA). Temperature was maintained between 60° to 68°F. Time of disinfection contact varied between 10 and 30 minutes depending on the specific study. Peptone thiosulfate dilution water was used as a neutralizer to stop the action of chlorine or chlorine dioxide at the end of the desired contact period. The possible presence of bacteriostasis was checked in each instance by reinoculating neutralized solutions with viable spores.

Specific Methods

Method A: Under this method the sporicidal properties of chlorine dioxide were compared to chloramines and "free chlorine", by treating a water containing ammonia and peptone below and beyond the breakpoint.

A series of ten tests were made with B. subtilis; five tests with B. mesentericus; and three tests upon B. megatherium. Each of the test spores were prepared by inoculating a number of nutrient agar slants and incubating the culture until spore forms were predominant as indicated by microscopic examination. The spores were then washed off with sterile water and the suspension boiled to destroy vegetative forms. The boiled suspension was diluted with a buffered water containing 10 ppm. NH_3-N and 50 ppm. peptone. The buffer capacity was necessary to maintain the pH between 7.0 and 7.5 in the presence of high chlorine doses. The ammonia was used to obtain a breakpoint with chlorine. Peptone was used to produce a chlorine dioxide demand. An aliquot of diluted spore suspension was added to each of a series of glass stoppered flasks and increasing amounts of chlorine and chlorine dioxide added to each. After 5 minutes contact, 1 ml. of the suspension was transferred to 99 ml. thiosulfate dilution water. Nutrient agar plates were then poured at appropriate dilutions. At the same time the spore transfers were being made, chlorine residuals were determined by orthotolidine, orthotolidine-arsenite, and iodide methods. Similar transfers and residuals were also repeated after 30 min. contact. Counts of spores vegetating were made after 48 hours incubation.

Method B: Under this second method of study the relative sporicidal efficiencies of chlorine dioxide and chlorine were studied on a spore suspension in a medium free from ammonia, organic matter, or other chlorine or chlorine dioxide demand substances, except that caused by the reaction with the spores themselves or the vegetative cells in the suspension that were destroyed before the tests were made. The general procedure for testing was similar to that used in Method A, except that chlorine demand and ammonia free water was used as the suspending medium for the test spores and extra precautions taken to free the suspension solution of ammonia and organic matter. To do this, the 20-day slants of B. subtilis and B. mesentericus were washed with 10 ml. of saline to form a suspension of both cells and spores. This suspension was then washed with fresh saline by centrifugation to remove organic matter. The spores were resuspended and held at 80°C. for 20 minutes to kill vegetative cells and spores of lesser resistance and the surviving spores were then added to four liters of buffered ammonia and chlorine demand free water and thoroughly mixed. This preparation was used as the test suspension.

RESULTS OF STUDY

Method A: A typical set of results from this method of testing, which compares chloramines, breakpoint "free chlorine" and chlorine dioxide

on the spores of B. subtilis, B. mesentericus, and B. megatherium is plotted in Figs. 1, 2, and 3.

These test results indicate that for an equal degree of spore kill, lesser OTA residuals are required from chlorine dioxide than from chlorine. As, for example, in Fig. 1, for B. subtilis, a 99 percent reduction resulted from the presence of 0.1 ppm. of chlorine dioxide as against a required OTA residual of 2.5 ppm. from chlorine after the breakpoint. For B. mesentericus, the relative OTA residual concentrations for the same kill were 2.0 ppm. for chlorine dioxide and 10.0 ppm. for chlorine. For B. megatherium the respective residuals for the same kill were 0.3 and 3.5 ppm. This same relative tendency is shown in other separate runs on the same spores.

Method B: The results of the tests where the sporicidal effect of chlorine dioxide on pure spore cultures suspended in a chlorine and chlorine dioxide demand free medium were studied, is shown in Fig. 4.

The results in this set of data showing the sporicidal effect of chlorine dioxide and the relative effect of "free" chlorine are roughly analogous to the data under Method A, where the free chlorine residual beyond the breakpoint was compared with chlorine dioxide.

These results show, as in the previous data, that chlorine dioxide is a sporicide if used in the proper concentrations. The OTA residuals required by chlorine dioxide were less than those by chlorine for equal degree of kill. As an example, for 99.9 percent kill of B. mesentericus, an OTA residual from chlorine dioxide of 2.0 ppm. was required. Chlorine OTA residual required was over 10 ppm. For B. subtilis, chlorine dioxide required approximately 1.0 ppm. residual and chlorine required a residual of 3.5. In terms of weight of gas applied, 5.5 ppm. of chlorine dioxide and 12.5 ppm. of chlorine was required for 99.9 percent kill of B. mesentericus; for B. subtilis, 3.0 and 6.3 ppm. were respectively required. This same relative tendency of chlorine dioxide and chlorine held true for all degrees of kill down to sterility. However, the divergence between the two gases increased as sterility was approached.

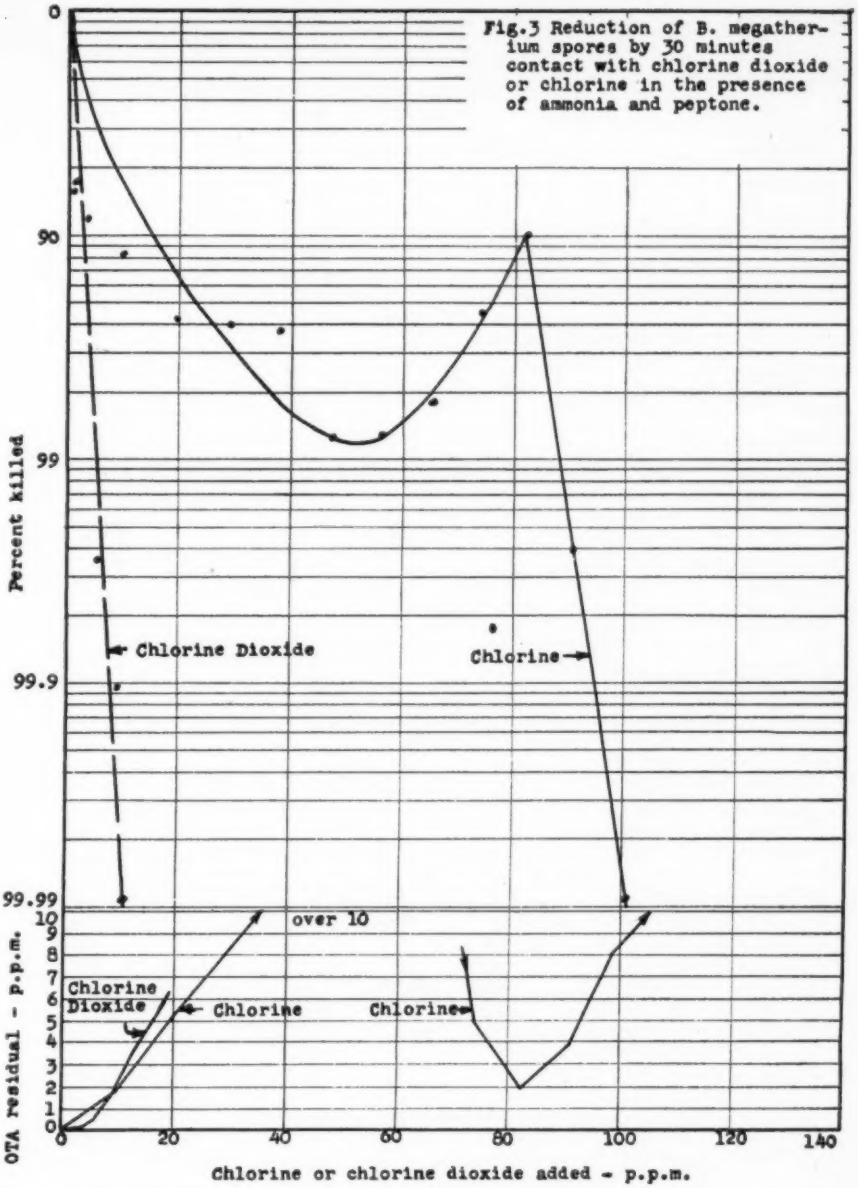

Fig. 3.—Reduction of B. Megatherium Spores by Chlorine Dioxide and Chlorine in 30 minutes
(In presence of ammonia and peptone)

Table I

SUMMARY OF RELATIVE SPORICIDAL EFFECTS OF CHLORINE AND CHLORINE DIOXIDE IN THE ABSENCE OR PRESENCE OF AMMONIA

Under Method A with Ammonia

OTA residual ("Free Chlorine" equivalent) to obtain 99% kill in 30 Minutes

Organism	(Before Breakpoint) O.T.A. residual	(Beyond Breakpoint) O.T.A. residual	(Chlorine dioxide) O.T.A. residual
B. subtilis	6.5	2.2	0.1
B. mesentericus	over 10	over 10	1.6
B. megatherium	over 10	3.5	0.3

Under Method B with Ammonia Free and Demand Free Medium

Amount in ppm. to obtain 99% kill in 10 minutes

Organism	(Chlorine)		(Chlorine dioxide)	
	Weight	O.T.A. residual	Weight	O.T.A. residual
B. subtilis	4.8	2.5	2.6	0.6
B. mesentericus	10	8	3.3	1.0

Comparison of Results from Methods A and B

A summarized version of the results of the studies under Methods A and B would be as shown in Table I.

Discussions

The data in this paper cannot necessarily be used, nor is it intended to be used for interpretation as to the proper general sporicidal concentrations of either chlorine dioxide or

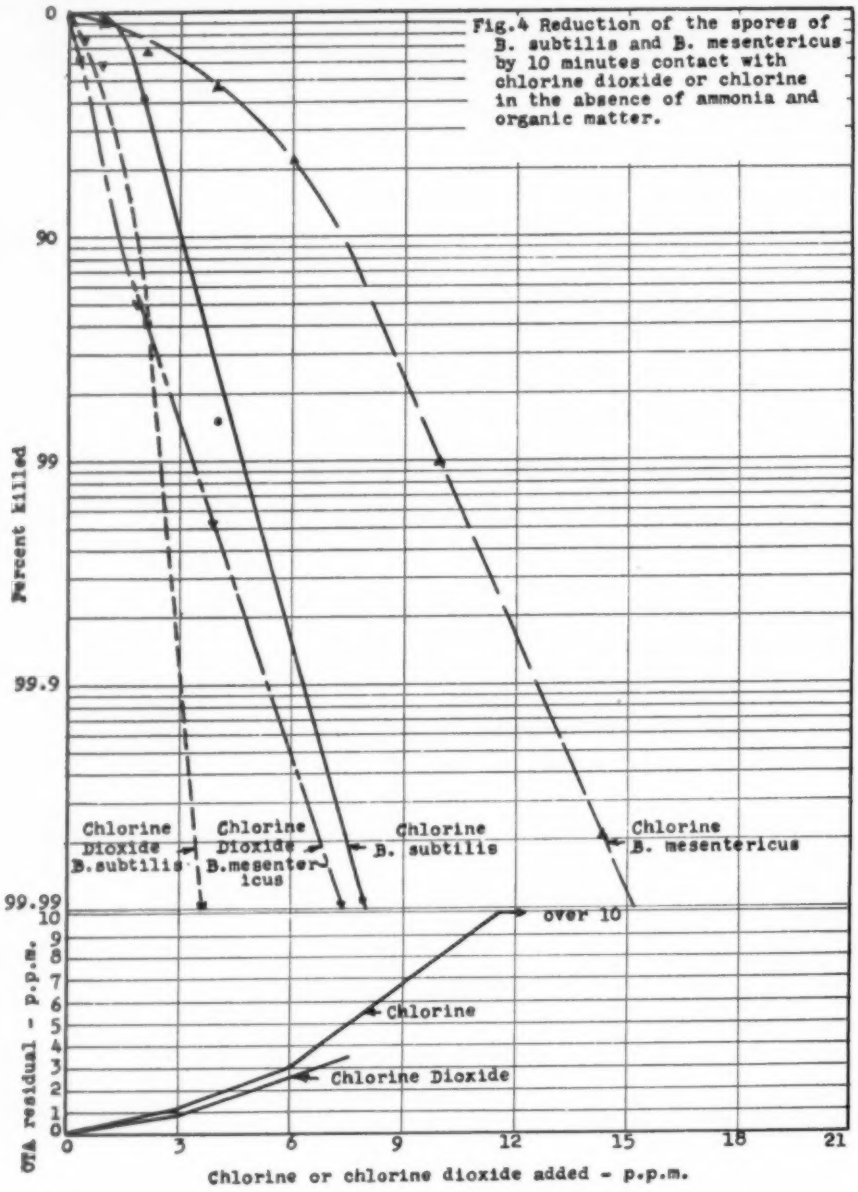
Fig.4 Reduction of the spores of B. subtilis and B. mesentericus by 10 minutes contact with chlorine dioxide or chlorine in the absence of ammonia and organic matter.
Percent killed
0
90
99
99.9
99.99
Chlorine Dioxide B.subtilis
Chlorine Dioxide B.mesenter icus
Chlorine B. subtilis
Chlorine B. mesentericus
over 10
Chlorine
Chlorine Dioxide
OTA residual - p.p.m.
Chlorine or chlorine dioxide added - p.p.m.

Fig. 4.—Reduction of Spores of B. Subtilis and B. Mesentericus by Chlorine Dioxide and Chlorine in 10 minutes

(In absence of ammonia and organic matter)

chlorine. Different sporulating organisms and individual organisms within the same species may differ in their resistance to disinfectants depending on the conditions which cause sporulation and more especially the severity of conditions. Therefore, individual bacteria in the same strain may show different tolerance levels to disinfectants.

The specific purpose of these studies has been to show whether chlorine dioxide does or does not possess sporicidal properties, and if so, how it might compare with "free chlorine" when used for such purposes in water treatment.

With this in mind, the major conclusions that can be drawn from these studies are that on the basis of OTA residuals chlorine dioxide is more effective as a sporicide than chlorine. That is, with the same O.T.A. residual existing in two solutions, one chlorine and the other chlorine dioxide, the solution containing chlorine dioxide more effectively destroys the spores. This phenomenon is apparently due to the fact that atom per molecule, chlorine and chlorine dioxide seem to act sporicidally much the same but the O.T.A. measures only one-fifth of chlorine dioxide potential valence change.

This difference in effectiveness between O.T.A. residuals of chlorine and chlorine dioxide on spores is much greater than on vegetative cells where the effect of O.T.A. residuals from each of the two gases seems to be approximately the same. The difference may be due to the lack of five full valence changes from chlorine dioxide in the case of the vegetative cells, whereas the chlorine dioxide is more reactive with the spore material and utilizes its entire potential oxidizing capacity to a fuller extent.

The amount of chlorine or chlorine dioxide needed to effect kill depends on the relative characteristics of the water with respect to chlorine or chlorine dioxide demands, types of chloro-compounds formed, etc. These data show, however, that in either chlorine and chlorine dioxide demand free waters, or in waters containing ammonia, less chlorine dioxide is needed than chlorine by weight, for a given kill of spores. In the former instance the result is due to the more effective action of the OTA residual from chlorine dioxide. In the latter, less weight is required not only by reason of the greater effectiveness of the same OTA residual, but also because chlorine dioxide is unreactive with ammonia.

It would appear from these data that chlorine dioxide could be used in water plant practice not only for the control of tastes and odors but also for the better control of spore contamination. If the spores which normally cause aftergrowth in water mains are as easily destroyed as the B. subtilis, then ordinary plant residuals from chlorine dioxide would give quite effective control of aftergrowths, due to spore contamination, in the water plants and systems.

Summary and Conclusions

Laboratory studies were made to obtain information on possible sporicidal properties of chlorine dioxide with the view of determining the potential application of the gas toward eliminating the annoyance of aftergrowths from spores in water plants and distribution systems. These studies were related to the effectiveness of chlorine for the same purpose, under the same conditions.

Results of these studies may be summarized as follows:

1. Chlorine dioxide is a more effective sporicide than chlorine if compared on equal OTA residual basis.
2. The effectiveness of OTA residual from chlorine dioxide as related to chlorine seems to be greater on spores than on vegetative cells. The difference may be due to the residual potential of four additional valence changes in the chlorine dioxide molecule which, on spores, may be more effective because of a more reactive nature of the spore material with the chlorine dioxide molecule.
3. Less weight of chlorine dioxide than chlorine is required in either demand free waters or in waters

containing ammonia. The difference in weight required depends on the ammonia content. In ammonia bearing waters, chlorine must be applied beyond the breakpoint before sporicidal efficiency is obtained equal that from chlorine dioxide.

4. It would appear from these investigations that chlorine dioxide could be used in water plant practice for the control of spore contamination in either water treatment plants or in water distribution systems. Under conditions where the ammonia content of the water requires breakpoint application of chlorine for control of spores, chlorine dioxide may offer a decidedly superior method of treatment.

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W. H. H. Putnam Named Manager at Birmingham

W. H. H. (Put) Putnam has been named Manager of the Birmingham Water Co., succeeding Al Norris, who left to become general manager of the Indianapolis Water Co.

Mr. Putnam is a native of Birmingham, and joined the company in 1927, after graduating from Auburn Polytechnic Institute. He is the past president of the Alabama Water & Sewage Association, and active in civic affairs.

N. E. W. W. A. Nominates Officers

The Nominating Committee of the New England Water Works Association has presented its list of nominees for officers to be elected for the year beginning in September, 1949. The nominees are as follows:

President
Sidney S. Anthony, Supt.
Augusta Water District
Augusta, Maine

1st Vice President
Thomas R. Camp, Cons. Engr.
Camp, Dresser & McKee
Boston, Mass.

2nd Vice President
Frederick O. A. Almquist,
Principal Sanitary Engineer
Conn. State Dept. of Health
Hartford, Conn.

Directors
Stanley M. Dore, Dep. Ch. Engr.
Metropolitan District Commission
Boston, Mass.

William B. Duffy, Supt.
Public Works Department
North Andover, Mass.

Roger G. Oakman, Supt.
Water Division
Needham, Mass.

Treasurer
William P. Melley, Supt.
Water Department
Milton, Mass.

Secretary of the Association is Joseph C. Knox, Senior Sanitary Engineer, Massachusetts Department of Health, Boston.

Nomination of officers for this association is usually tantamount to election.

Eliassen Heads M.I.T. Sanitary Engineering Dept.

The appointment of Dr. Rolf Eliassen as Professor of Sanitary Engineering in the Department of Civil Engineering at Massachusetts Institute of Technology has been announced. Dr. Eliassen assumed his new duties on July 1.

In his new capacity Prof. Eliassen will be in charge of the graduate course in sanitary engineering as well as the extensive undergraduate work given within the civil engineering course. He will also supervise research on industrial waste treatment as well as studies in water supply contamination and purification.

Dr. Eliassen, a graduate of M.I.T. with an M.S. and Sc.D. from the same school, has taught at the Illinois Institute of Technology and at New York University, where since the war he was Professor of Sanitary Engineering and head of the Lewis V. Carpenter Sanitary Engineering Laboratories. During the war Prof. Eliassen rose to the rank of Lt. Col. in the Corps of Engineers, where he was in charge of the Sanitary Engineering Division of the Second Service Command. He is a member of A.S.C.E., A.P.H.A., A.W.W.A., and is a member of the Executive Committee of the N.Y.S.S.W.A.

Charles P. Hoover Honored

Receives Doctor of Engineering Degree from Ohio State University

At the Ohio State University Commencement exercises on June 10, 1949, Charles P. Hoover, Superintendent of Water Purification at

Columbus, Ohio, and well known water works man, was awarded the honorary degree of Doctor of Engineering.

The citation for this award read as follows: "—for the degree of Doctor of Engineering, Charles P. Hoover, Class of 1908, internationally known scientist, able and devoted public servant. He has distinguished himself for his work in the purification and betterment of municipal water supplies for household and industrial uses. In his forty years of continuous service with the Columbus Water Works, he has been in the fore front in the development of processes and techniques for the softening and purification of water. In recognition of the quality of his researches, of the benefaction which his work has brought to every home in the community, and to the State, and to the Nation, . . . Charles P. Hoover is herewith presented for this honorary degree."

In 1948 Mr. Hoover received honorary membership in the American Water Works Association, and in 1943 he was a Fuller awardee.

PACIFIC-NORTHWEST MEETINGS IN BELLINGHAM, WASH.

A Report on the Sixteenth Annual Meeting of the Sewage Works Assn. and Twenty-Second Annual Conference of the A.W.W.A. Sect.

by
HARRY A. FABER*
Editorial Associate
WATER AND SEWAGE WORKS

Chairmen

Retiring
Kenneth Spies
Oregon Sanitary Auth.
Portland, Ore.

Incoming
Emil Jensen
State Dept. Health
Seattle, Wash.

BELLINGHAM, Wash., on Puget Sound, was host to the Pacific-Northwest Sewage Works Assn. and to the A.W.W.A. Section at their meetings on May 11 to 14 inclusive. The location was particularly fitting as this city is served by an excellent gravity supply of soft mountain water and has completed construction of a modern primary sewage treatment plant. The program offered tours to the water screening and chlorinating plant (where residual recording equipment is installed), to the new sewage treatment plant, to a sulfide pulp mill, and to an industrial waste treatment plant where alcohol is manufactured from waste sulfite liquor.

MEETING OF SEWAGE ASSN.

The Sewage Works Association meeting, on May 11th, featured two technical programs which included discussions of the status of water pollution control, a plant operation panel, and an operators' forum luncheon. President K. H. Spies presided at the annual dinner meeting at which the speaker of the evening, L. H. Enslow, President of A.W.W.A., and Editor, *Water and Sewage Works*, discussed the progress of the Federation of Sewage Works Associations. An unusual and commendable procedure was followed by A. L. Frick, Chairman of the membership committee. Mr. Frick, announcing that the membership had grown to 184, made the individual introduction of each new member one of the first items of business.

New Officers

The Pacific-Northwest Sewage Works Assn. elected the following officers to serve for the 1949-1950 term:

President
Emil C. Jensen, Chief
Div. of Pub. Health Engrng.
Seattle, Wash.

Awardee
Carl E. Green
Cunningham Engrs.
Portland, Ore.
(The Bedell Award)

First Vice President
W. P. McNamara, Engr.
City Engrng. Dept.
Seattle, Wash.

Second Vice President
W. W. Tinniswood, Asst. Prof.
Dept. Civ. Engrng.
University of Idaho
Moscow, Idaho

2nd Vice Chmn.
W. W. Tinniswood
Univ. of Idaho
Moscow, Id.

Secy. & Treas.
Wm. P. Hughes
City Engr.
Lewiston, Id.

1st Vice Chmn.
W. P. McNamara
City Engr.
Seattle, Wash.

Nat'l Director
C. M. Howard
Concrete Prod. Assn.
Seattle, Wash.

Secretary-Treasurer
W. P. Hughes, Supt.
City Water Dept.
Lewiston, Idaho

Technical Program

Titled **"The Status of Water Pollution Control in the Pacific-Northwest,"** a symposium covering three states and the Province of British Columbia, was first on the technical program.

H. C. CLARE, Director, Division of Public Health Engineering, State Dept. of Public Health, Boise, discussed the situation in Idaho.

He described the existing statutes and legislation as inadequate, but noted that an increasing public and official trend exists toward improved conditions. The present fundamental need is for establishment of a definite state policy and for certain enabling statutes.

Constitutional limitations now prevent revenue bonds as a solution, and municipalities may incur no indebtedness which exceeds their income. As yet, there is no legislation to organize a specific pollution control agency. Two sewage treatment plants are under construction in Idaho; an activated sludge plant at Boise, and a biofiltration plant at Napa. Pollution problems of this state are not critical, but a preventive program is needed.

CURTIS M. EVERTS, JR., Secretary and Chief Engineer, State Sanitary Authority, Portland, discussed the situation in Oregon.

*Research Chemist, The Chlorine Institute, Inc., New York

Projects under way in this state include construction of eight major sewage treatment plants, and bonds have been authorized for many new projects. Steps taken by the last legislature of the state have made a considerable contribution to further progress.

Chairmen

Retiring
Jas. E. Morrison
City Manager
Ellensburg, Wash.

Incoming
B. C. Gosney
Supt. Water & Sewage
Auburn, Wash.

A bill has been passed which sets up a 1.5 million dollar fund available to small Oregon municipalities. Those of 2,500 or less in population, which are unable to sell their bonds on the public market, may, with suitable provisions, borrow from the State Bond Commission. This Commission may purchase bonds up to 50 per cent of the assessed valuation of the municipality. The legislature also amplified and legalized the formation of Sanitary Districts within the state.

REGINALD BOWERING, Public Health Engineer, Provincial Board of Health, Victoria, discussed the situation in British Columbia.

This province is fortunate in having stream pollution legislation which was enacted as early as 1880. It is required that plans be submitted to, and that wastes shall not be discharged without the approval of, the Provincial Board of Health. While the dilution capacity of streams in the province is great, industrial growth has been rapid and stream pollution is an approaching problem.

Vice Chmn.
Elmo James
Supt. Water
Spokane, Wash.

Secy. & Treas.
*O. P. Newman**
Boise Water Co.
Boise, Id.

**Succeeds Fred. Merryfield, resigned.*

Coastal cities of British Columbia discharge raw sewage to the ocean but provide treatment in some cases where this is required in order to prevent bathing beach contamination. Four interior cities have primary treatment plants. It has always been the practice to fit the treatment required to the use of the receiving stream.

An industrial waste study is to be started this year in order to measure existing conditions and to organize a preventive program. The pollution problem is not great at present and it is hoped that suitable treatment can be instituted as the need develops.

E. F. ELDRIDGE, Director and Chief Engineer, State Pollution Control Commission, Olympia, discussed the situation in the State of Washington.

The State Pollution Control Commission has recently been reorganized and considerable work remains to be done in the state. There are large areas in and around towns which require sewerage and sewage treatment plants. About 76 per cent of Washington communities have some form of sewage treatment, but only 68 plants are considered adequate. These 68 plants serve about 15.4 per cent of the population.

Awardee
Robt. A. Duff
Sup't of Water
Medford, Ore.
(The Fuller Award)

A number of new treatment plants are under construction and many plants are in the planning stage. The Pollution Control Commission has resolved that primary treatment shall be the minimum to be provided, and this requirement is the same as for Oregon and California. Industrial waste treatment is a part of the program planned by the Commission. There exists a definite need for industrial waste treatment, since the pollution load (B.O.D.) of wastes from this source is far greater than that from domestic sources.

In reply to questions from the floor, Mr. Everts (Oregon State Sanitary Authority) noted that the State Bond Commission has set the interest rates on bonds to be not over 4 per cent. He explained that the Sanitary Authority is a division of the State Board of Health, responsible for enforcement of stream pollution laws, utilizing the facilities of the Board, but having a separate appropriation and staff. Mr. Eldridge (Washington State Pollution Control Commission) stated that the State Sanitary Engineer is technical Secretary of the Pollution Control Commission. There is joint review of plans for waste treatment, and both the Commission and Division of Sanitary Engineering have veto power over plans.

National Directors

Incumbent
Walter J. Moore
Supt. Water & Elec.
Eugene, Ore.

Elect
*Fred Merryfield**
Oregon State Col.
Corvallis, Ore.

**Retiring as Secy. & Treas. after long service.*

Sewage Plant Operation Panel

"Economies Derived From Laboratory Analysis," by R. O. Sylvester, Asst. Prof. Civil Engineering, University of Washington.

Professor Sylvester clearly showed the practical value of laboratory analysis applied to control of sewage treatment plant operations for obtaining maximum efficiency. The results of analyses indicate the removals by primary units, and knowledge of these removals affects the operation of subsequent treatment units. The pH value of sewage may warn the operator of septic conditions and resulting plant operating troubles. He illustrated how many other determinations—residual

Hosts

Irene Jacobson
Chlorination Super.
Bellingham, Wash.

*Henry Donnelly**
Supt. of Water
Bellingham, Wash.

**Chm'n. Convention Arrangements.*

chlorine, dissolved oxygen, B.O.D., etc.—may be important in correcting nuisances, saving chemical and labor costs, and in enlarging plant capacity.

"Plant Safety," was discussed by R. E. Leaver, Sr. Public Health Engineer, Washington State Dept. of Health.

As a practical measure, Mr. Leaver suggested that designing engineers should provide a list of safety hazards in the plant and the plant operators should regularly check all of these. Among particularly dangerous items he listed rails, fences, moving parts, and electrical equipment. A survey by the State Health Dept. showed the best sewage treatment plant to exhibit a 76 per cent compliance with safety features. Particular emphasis was placed on the need for safety belts, first aid kits. inoculations, and gas masks.

NORMAN WAGONNER of the Health Department discussed practical measures to protect against dangerous gas conditions, with special reference to toxic or poisonous gas, suffocating gas, and explosive gas.

"Make Your Chlorination Pay Dividends," was the title of the talk by Harry A. Faber, Research Chemist, the Chlorine Institute, Inc., New York, N. Y.

Mr. Faber showed the relation of sewage chlorination to primary and secondary sewage treatment processes, and stressed its importance in controlling the growth of both pathogenic and non-pathogenic bacteria. The dividends obtainable by proper use of chlorination include better public health, better public relations, and better plant operation. He described how these ends can be accomplished by destroying pathogenic bacteria and by reducing the activity of the non-pathogenic bacteria which produce septic conditions and objectionable odors.

"Gaining Community Interest," was the topic of a talk by L. L. Sphar, Associate Engineer, Parker and Hill, Consulting Engineers, Seattle, Wash.

It is important to overcome the typical general reaction of the public to sewage and sewage treatment, said Mr. Sphar, in order to gain the respect and support of the community. When this is done, better job security and more funds for plant operation will be forthcoming. How this is to be done will involve a long-range publicity program developed to fit local conditions. The useful and practical measures suggested are making the plant attractive, actively encouraging the visits of local groups, movies and exhibits of plant operations, newspaper publicity, and many others.

Federal Pollution Control Bill

"The New Federal Pollution Control Bill," was reviewed by R. R. Harris, Sr., Sanitary Engr., Div. of Water Pollution Control, U. S. P. H. S., Portland, and L. R. Durkee, Division Engr., Federal Works Agency, Bureau of Community Facilities, Seattle.

Mr. Harris presented an analysis of the new Federal stream pollution control bill (Public Law 845). While financial support has been authorized, no funds have yet been appropriated, and only a skeleton staff is organized. Offices of four of the fourteen river basins have been set up. The staff of the Cincinnati laboratory has been increased, and aid has been provided by various State Health Departments. A water pollution advisory board has recently been appointed.

Mr. Durkee discussed the responsibilities of the Federal Works Agency in connection with the water pollution control program. When appropriations have been made available, loans of not more than one-third of the cost of construction will be granted—contingent upon the approval of applications by the State Health Department or Pollution Control Agency having jurisdiction. The interest rate will be 2 per cent, to be secured by local bond issues. For preliminary planning and study, a grant of not more than one-third (and not to exceed $20,000) may be made for a single project.

"Alcohol Production During Waste Disposal," was presented by Donald L. Reed, Alcohol Plant Supt., Puget Sound Pulp and Timber Co., Bellingham.

Wastes resulting from the manufacture of wood pulp by the sulfite process provide the raw material for producing ethyl alcohol. Mr. Reed noted that the plant at Bellingham, built during the war with over one million dollars of Government funds, is the only such plant in the U. S. Alcohol production from this source is a financially successful operation. The entire flow of waste liquor from this 300-ton-per-day pulp mill is treated, reducing the pollution load 35 per cent through removal of sugars.

About 8,000 gallons of alcohol are recovered daily from the 600,000 gallons of waste liquor. In the cooking of wood chips, hydrolyzed sugars (chiefly glucose) are produced; they comprise about 2.5 per cent of the total solids in the waste. The liquor, fermented with yeast for an 18-hour period, has its sugar content reduced to practically zero and contains 1.2 per cent alcohol. Following fermentation, the yeast is recovered by centrifuging, the alcohol is obtained by distillation, and the liquor is discharged to waste.

From one to six tons of baker's yeast is needed at the start of the fermentation process. Food is required (ammonia); the yeast becomes acclimated and grows to about 15 tons. The process is controlled so that new yeast is seldom added. This plant operates under Federal supervision, an inspector being present at all times, and the majority of its product is shipped to government denaturing plants. Mr. Reed stated, in answer to a question, that yeast could be made the primary product of the plant; stills would not be required, but increased nitrogen food and a large volume of sterile air would be essential.

Jack Service, Sparling Meters, Los Angeles — *Ben S. Morrow, City Engr., Portland, Ore.* — *J. C. Gearhart, Stevens & Koon Engrs., Portland, Ore.* — *Harry A. Faber, The Chlorine Inst., New York* — *H. D. Fowler, H. D. Fowler Co., Seattle, Wash.* — *J. H. Peterson, Transite Pipe Div., San Francisco*

Ben Nelson
City Engr.
Pullman, Wash.
and
Mart Early
Supt. Water & Sewage
Moscow, Id.

Tom H. Judd
Sup't Distrib.
Spokane, Wash.
and
"Will" Cook
Proportioneers
Seattle, Wash.

Ralph Schaeffer
Bryan Shera, Engr.
Jim Baldwin
Penna. Salt Co.
Tacoma, Wash.

G. M. Irwin
Water Commissioner
Victoria, B.C.
and
John Cunningham
Cons. Engr.
Portland, Ore.

W. A. Kunigk
Supt. of Water
Tacoma, Wash.
and
H. R. Vinson, Pres.
Boise Water Co.
Boise, Id.

TWO-DAY WATER WORKS MEETING

Of outstanding interest in the program of the Pacific-Northwest Section of the A.W.W.A. were discussions of flood damage, a breakfast round table devoted to operators' problems, and the business session held after a buffet supper. Presiding officers at various times were: W. W. Tinniswood, Univ. of Idaho; E. J. Allen, Seattle; John C. Gearhart, Portland; and C. Ray Harlock, McNeil Island, Washington. Following the two days of technical meetings Henry J. Donnelly, Water Supt., conducted a tour of public works of the City of Bellingham.

Chairman of the Section, James E. Morrison, was toastmaster at the annual banquet and L. H. ENSLOW, President of the A.W.W.A., was speaker of the evening. In discussing Association affairs, Mr. Enslow announced that the national membership exceeds 7,400, and he gave particular credit to Secretary Jordan for this continued growth. He reported, as a new Association undertaking, the plan to provide survey data regarding comparative salaries of water works employees.

A Committee of the Pacific-Northwest Section, of which C. M. EVERTS was Chairman, recommended that voluntary certification of operators be adopted by the States and Provinces comprising this Section. The plan would involve the preparation of uniform standards for operators, as decided upon by representatives of water works personnel and the health departments concerned. Training programs would be developed to precede or accompany certification, and acceptance of certification would be voluntary until the section should recommend that it be made compulsory. After discussion, it was voted to postpone action on the report.

New Officers

The Pacific-Northwest Section of A.W.W.A. elected the following officers to serve for the 1949-1950 term:

Chairman
B. C. Gosney, Supt.
Water Department
Auburn, Wash.

"Hands Across the Border"
Chief Engineers of Provincial and State Health Depts.
Reginald Bowering, Victoria, B.C.
and
Curtiss Everts, Portland, Ore.

Vice-Chairman
Elmo James, Supt.
Water Division
Spokane, Wash.

Secretary-Treasurer
Oscar P. Newman, Secy.
Boise Water Corp.
Boise, Idaho

Technical Program

A symposium titled **"1948 Flood Damage to Water Systems in the Pacific-Northwest"** included speakers representing the States of Idaho, Oregon, and Washington, and the Province of British Columbia.

H. C. CLARE, Director, Public Health Engineering, Dept. of Public Health, Boise, Idaho, described the situation existing during May and June of 1948 as a flood exceeded only by conditions known in 1894. A combination of temperatures was the cause; early in the year temperatures were subnormal; water content of snow was above 50 per cent. Then temperatures rose rapidly and, at the same time, precipitation was above normal. Emergency water supply treatment was necessary at several Idaho communities, and sterilization of distribution systems was required at others. It has been recommended that all towns develop sources of ground water supply, above the flood plain, for future protection.

H. MORETTY, Supt., Parkrose Water District, Portland, Oregon, discussed experiences in his state. Contamination of supplies was extreme in many areas; not only was sterilization of distribution systems imperative but, in many instances, sterilization of plumbing fixtures within homes was practiced. Loss of revenue was a result affecting smaller communities especially. Cooperation by water utilities not affected by floods, and by State and County Health Departments, received particular praise.

LLOYD C. AJAX, Senior Sanitarian, Dept. of Public Health, Wenatchee, Wash., presented data concerning damage to the Wenatchee water system. After heroic efforts to keep the pumping and filtration plants in operation, with assistance from all sources, and with every emergency measure, the flood won the contest—but only for 36 hours. Water in the storage reservoir was saved for a fire emergency, and a fleet of tank trucks was employed to deliver approved water

Here and There at the Meetings
On either end are two of the colorful floats in Bellingham's Tulip Festival and Pioneers' Parade. Center picture is a demonstration of a combination trenching machine and utility loader. On either side are snaps during the visit to Bellingham's new Sewage Treatment Plant.

for domestic use. In spite of chlorine tastes throughout the city, there were no complaints; neither was there any water-borne disease.

R. BOWERING, Director of the Division of Environmental Sanitation, Provincial Dept. of Public Health, Victoria, B. C., noted that only about 10 per cent of the 150 water supplies in British Columbia are not gravity supplies. Only two public water supplies became contaminated; coliform counts continued to rise in these systems and heavy chlorination was required. The major problem was with over 400 private wells (72 per cent were driven wells) which showed contamination. No one was permitted to return to his home until the well was sterilized and approved by the Health Department.

"Public Relations in Action," was the title of the talk by Fred Merryfield, Prof. of Civil Engineering, Oregon State College, Corvallis, Ore.

Professor Merryfield has a facility for humorous but penetrating comment which, unfortunately, cannot be conveyed in reporting his discussion. He proposed the question "How to advertise something people already get?" And he answered it by explaining methods by which the maximum service can be provided with the minimum of friction. Mechanics (inventory, records, maps), maintenance (repairs, equipment, and organization), and manpower (employees, consumers, commissioners) might constitute a summary of the subjects he discussed as important considerations in good public relations.

"Deep Well Pumps and Related Problems," by Marius Anderson, Consulting Engr., Seattle, Wash., contained much useful information on pumps and pumping. Mr. Anderson reviewed geological characteristics of soils, protective measures against pollution, and methods of well construction. Only turbine types of pumps are efficient for deep well application. The construction and care of casings, impellers, bearings, etc., were described.

The paper was discussed by PROF. ROBERT SYLVESTER, Univ. of Washington, Seattle, who enlarged upon the advantages of deep well sources. He pointed out that treatment is generally not required, seasonal variations in quality are limited, and operation of these supplies can generally be automatic. As disadvantages, he noted that corrosion, tuberculation, and growths of iron-bacteria frequently appear; over pumping, lowering of the water table, and interference between wells may constitute definite operating limitations.

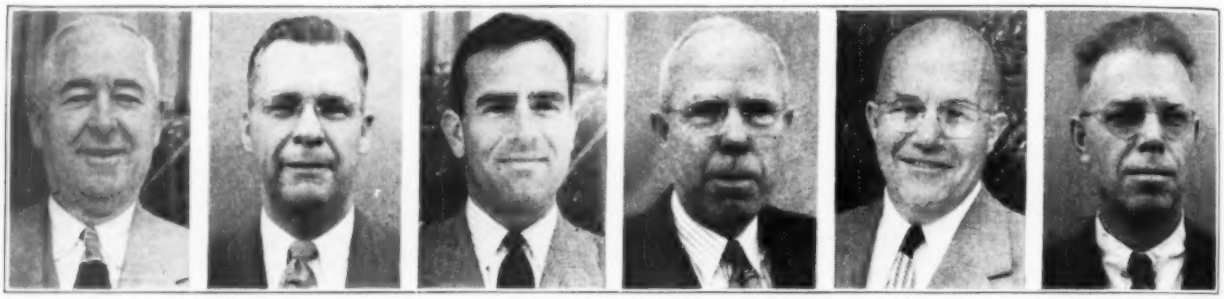
"Cross Connections," were reported upon by Committee Chairman E. J. Allen, Asst. Supt., Seattle Water Dept., Seattle, Wash.

Mr. Allen reviewed the background and present status of this subject, commenting upon the divided responsibility for water quality which exists on private property. The contributions and continuing program of the U. S. Public Health Service represent fundamental progress in correcting cross connection hazards. Each community must have a satisfactory plumbing code on private premises. Experience in Seattle was cited to illustrate requirements and how problems have been solved.

OMAR C. HOPKINS, Regional Engineer, U. S. Public Health Service, San Francisco, Calif., discussed Mr. Allen's paper. He emphasized the need for local programs which will be effective both in discovering and eliminating physical connections to public water supplies.

In **"Jack Frost and the Water System in 1949,"** Fred D. Jones, Foreman, Water Dept., Spokane, Wash., told how the abnormally cold weather and deeply penetrating frost during the past winter created a very costly and difficult problem in Spokane. Several factors together were responsible for a frost penetration of 5 to 6 feet. Mr. Jones described problems involved in providing suitable equipment and trained personnel to thaw water mains. Because of electric utility power shortage, it was necessary to utilize power-operated generators (welding generators did not prove satisfactory). Difficulties were caused by grounded 220 volt power lines, by inability to flush hydrants (the ice formed caused traffic hazards), and by bad tastes (apparently caused by arcing at sulfur joint compounds in the mains). While a charge of $7.50 was made for thawing connections frozen inside property lines, no charge was made when the connection was outside property lines. The total cost of the work to the city was about $100,000.

H. Loren Thompson, Partner, Stevens and Koon, Portland, Ore., employed lantern slides to illustrate details of construction of **"Prestressed Circular Concrete Reservoirs,"** with particular reference to a tank of 1.5 mil. gal. capacity. This procedure requires compression of reinforcing rods above the base of the tank, poring and compressing the circular wall in several vertical sections. Such tanks have a high degree of resistance to earthquake damage.



H. A. "Perk"erson
Sales Mgr.
M. & H. Valve Co.
Anniston, Ala.

H. C. Clare
Chief Engr.
State Dept. Health
Boise, Id.

Jack W. Pratt
Sales Engr.
Process Engrs. Inc.
San Francisco

E. F. Eldridge
Engineer
Pollution Control Com.
Olympia, Wash.

"Abe" Frick
Dist. Mgr.
W. & T. Co.
Seattle, Wash.

Ray Harlock
Supt. Water Plant
McNeil Island
Steilacoom, Wash.

GORDON INGMAN, Parker and Hill, Seattle, Wash., discussed the pre-load wire-wound type of concrete tanks, stressing the importance of high grade steel and concrete for construction work of this nature.

The **"Effect of the Use of Water Works Income for General Municipal Purposes,"** was explained by W. Chester Morse, Supt., Water Dept., Seattle, Wash.

The City of Seattle has tried to develop good public relations through a full explanation of the fact that, while water rates parallel those elsewhere, the water department has paid $1,023,000 into city funds. Mr. Morse noted that fixed rate charges are generally made for fire hydrants, city parks, etc., but that water used for these purposes costs exactly the same as any other water to produce. Accu-

A.W.W.A. Section's Committee Chairmen

W. C. Morse
Supt. of Water
Seattle, Wash.
(Awards)

Arthur Musgrave
Municipal Engr.
Oak Bay, B.C.
(Program)

W. A. Kunigk
Supt. of Water
Tacoma, Wash.
(Nominating)

E. J. Allen
Asst. Supt.
Seattle, Wash.
(Cross Connections)

"Ed." Hallgren
E. N. Hallgren Co.
Seattle, Wash.
(Membership)

W. G. Wilmot
Supt. Wat'r & Swge.
McMinnville, Wash.
(Public Relations)

"Ed." Thompson
N. W. Mgr.—Seattle
Neptune Meters
(Entertainment)

rate bookkeeping furthers economy, since no municipal department charged with the actual amount of water used will waste water.

In discussing **"Water Treatment,"** Lee F. Chaney, The Flox Co., Inc., Portland, Ore., summarized the nature of corrosive and scaling factors in water, then related these to the treatment of municipal water supplies. In the Northwest most waters can be adequately stabilized by pH adjustment or by pH adjustment in conjunction with polyphosphates. When the supply contains iron and manganese the most effective treatment is chlorination followed by treatment with polyphosphates.

"Water Chlorination in Principle and Practice," was reviewed by Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

In developing general laws through the evaluation of chlorination principles and practices, Mr. Faber summarized the characteristics of water, the reactions of chlorine in water, and specific treatment problems. While both combined and free available forms of chlorine can be employed for bactericidal purposes, only free residual chlorination can be employed for purposes of chemical oxidation.

"Water Resources Investigations of the U. S. Geological Survey in the Pacific-Northwest," were described by F. M. Veatch, District Engr., Water Resources Branch, U.S.G.S., Tacoma, Wash.

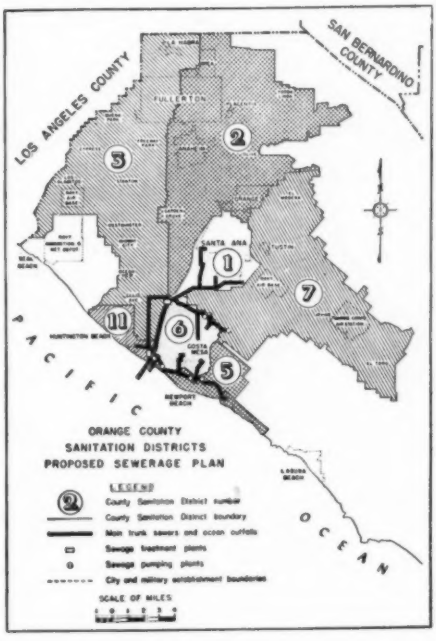
Mr. Veatch told of the excellent quality of water supplies in the Pacific-Northwest, but emphasized that the supplies are of somewhat limited and variable quantity. Records of the U.S.G.S., obtained by measuring the flow of surface supplies, are utilized by states, industries, and the public. Underground water investigations are just being started, and much remains to be learned with reference to the chemical quality of waters in the Pacific-Northwest.

ORANGE COUNTY, CALIF. APPROVES SEWAGE TREATMENT PLAN

Seven Sanitation Districts of Orange County, California, have approved bonds totalling $8,308,000 by an overwhelming majority of 7 to 1. The districts will eventually provide major outfall, treatment, and disposal facilities for an area of 340 square miles.

Sewage works facilities to be constructed at the present time include: (1) trunk sewers varying in diameter from 12 to 90 inches; (2) a 78-in. diameter reinforced concrete ocean outfall extending 7,000 ft. into the Pacific Ocean and discharging at a water depth of 60 ft.; and (3) a primary-type of sewage treatment plant comprising as main features plain sedimentation (1 hour), separate sludge digestion, and effluent chlorination when necessary. Extensive ocean current studies have demonstrated that the ocean outfall will have to be extended to a total length of 15,000 ft. in approximately 15 years at which time the depth of discharge will be 120 ft.

Trunk sewers have been designed for the 1990 estimated population and the sewage treatment plant has been designed for expansion at ten-year



intervals. The initial treatment plant installation will have a capacity of 50 mgd.

The sanitation district plan is the result of a county-wide survey, report, and recommendations by Messrs. A. M. Rawn, Charles G. Hyde, and Franklin Thomas, retained as consulting engineers. The ultimate plan calls for facilities totalling more than $27,000,000.

All of the districts have joined in an administrative agreement under which they will maintain a single centralized joint administrative and engineering office. Willis H. Warner, chairman of the Board of Supervisors, is general manager on a part-time basis and Vinton W. Bacon is sanitation engineer for all of the districts.

Manufacturers Plan Exhibits for Fall Conventions

As of July 1, thirty-six members of the Water & Sewage Works Manufacturers' Assn. had reserved exhibit space for the forthcoming convention of the New England Water Works Assn., scheduled for The Balsams, Dixville Notch, N.H., Sept. 13-16.

At the same time twenty-six (26) manufacturers had reserved exhibit space for the convention of the Federation of Sewage Works Assns., scheduled for Hotel Statler, Boston, Mass., Oct. 17-20.

Advance hotel reservations for both meetings indicate that registration will be good.

SOIL TEST HOLES REDUCE RISK IN ESTIMATING COST OF TRUNK SEWERS

by
VINTON W. BACON
Engineer
COUNTY SANITATION DISTRICTS
OF ORANGE COUNTY,
SANTA ANA, CALIF.

UNDER the best of circumstance during the post-war years, estimating the cost of construction of large trunk sewers has been a difficult and somewhat hazardous task. Practically all engineers, at one time or another during this period, have been bitterly disappointed when their carefully prepared estimates have differed widely from the actual construction costs in the end.

The Author

For bond election purposes for the County Sanitation Districts of Orange County, Calif., in estimating trunk sewer costs the engineers were confronted with the usual difficulties inherent to the unstable price conditions and labor costs, plus the fact that the proposed large trunk sewers would transverse areas in which the subsoil and ground-water conditions were almost completely unknown. Therefore, to reduce the risk and uncertainty as much as possible, a systematic program of soil test-hole drilling was conducted as herein described.

The bond elections, for which the cost estimates were being prepared, were to finance (in addition to the sewage treatment plant and ocean outfall) trunk sewers varying in diameter from 12 to 90 inches and having a total length of 32½ miles. It is believed that the equipment and methods employed would be equally adaptable and valuable to much

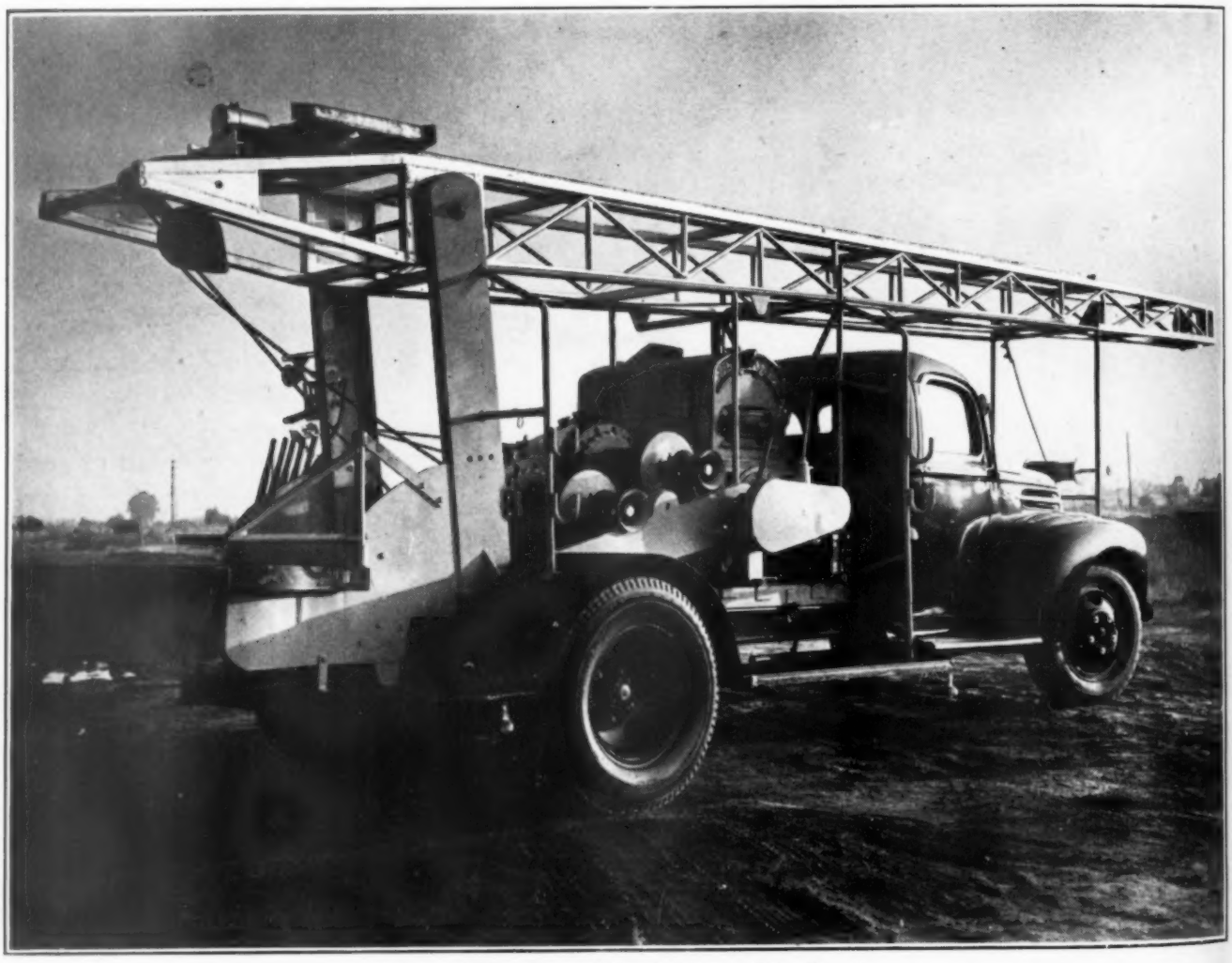


Fig. 1—Drilling Rig with Derrick Lowered for Travel.
(One hoisting drum raises and lowers the derrick; the other raises and lowers drilling bucket during operations.)

smaller undertakings, particularly so, since the equipment described is readily available in areas where water-wells, cesspools or drainage-wells are dug with the ordinary earth-boring machine.

Necessary Preparatory Work

After the preliminary engineering work had indicated the proper location and depth of the various trunk sewers, a certain amount of preparation was necessary before actual test-drilling could be started. For instance, where crossings over private property were contemplated, it was necessary to obtain permission for the test-hole work from the owner. Usually this involved only one letter of request describing the reasons for wanting to do the work, together with a map showing the location of the proposed trunk sewers and test holes. In all cases permission was readily granted, undoubtedly because of the complete recognition of the urgent need of the county-wide sewerage project. We also offered to furnish copies of the test-hole "logs" to each land owner, and we found such to be desired by most of them.

It was also necessary to obtain permission from the State and County highway departments and the engineering departments of the incorporated cities for drilling within their respective road right-of-ways. Here again this was a simple routine matter involving a letter of request and a location map.

Where possible, the test holes were located near, but not on, street intersections. This procedure eliminated some of the field location work of the survey party. Those holes between street intersections and in the undeveloped areas were located by rough chaining. In one totally undeveloped area, the route was surveyed by stadia-transit. It should be emphasized that the data sought were somewhat general in nature, and, therefore, the hole location was not necessarily precise and did not follow any inflexible spacing or pattern of location.

Of extreme importance (even in undeveloped areas) was the location of underground utilities, such as natural-gas lines, oil-field lines, storm drains, telephone cables, power conduits, water and irrigation mains, local sewers, and open-joint drainage lines common to agricultural areas where the ground-water table has been high. In most cases the private and public utility companies and the special districts furnished certified detailed location sketches. Using these, the engineer with the drilling crew would select the final location as near as possible, usually within a few feet, to that established by the survey party. Despite these precautions, our night crews broke a ¾ in. copper natural-gas house connection. The expense and, more important, the difficulties experienced because of this small accident, clearly emphasized the importance of accurate location of the underground utilities.

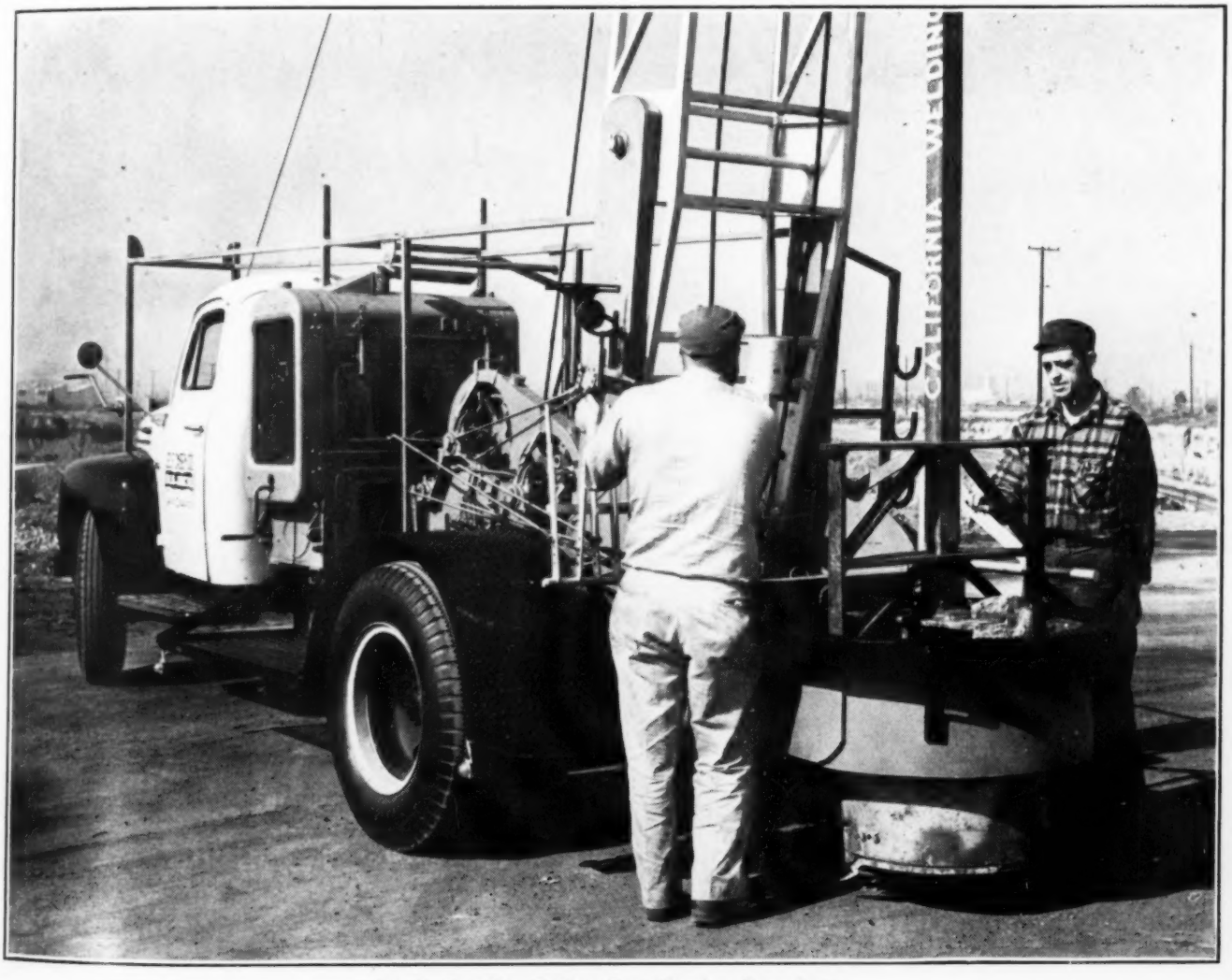


Fig. 2—Two-Man Drilling Crew Starting Operations

(Power is transmitted from ring gear to drilling bucket through the square perpendicular Kelly Bar and the trussed yoke engaged by lugs on inside of ring gear. Note cutting knives on bottom of bucket.)

Drilling Rig & Equipment

An ordinary earth-boring machine of the type commonly used in Southern California by cesspool drillers, water-well drillers, and foundation men was employed with considerable success and economy for drilling the deep soil test holes. This equipment is illustrated in Figs. 1, 2, 3, 4, and also in the cover picture.

Fig. 1 shows the truck with its 32-ft. collapsible derrick lowered to the horizontal position for moving from location to location. A gasoline-engine auxiliary power unit for operating the hoisting drums and for driving the ring gear and bucket is located immediately behind the cab on this rig. The turn table is at the extreme rear end of the rig. For transportation between holes (not illustrated), the auger bucket is supported on the turn table by merely inserting a heavy steel rod through holes in the side of the bucket.

The complete rig, in drilling position, is shown in Fig. 3. However, in our work we seldom had to use the leveling jacks shown at the rear of the rig. The auger bucket is suspended by means of a ½-in. wire rope and a 3-in. square, 22-foot long, solid iron bar, called a Kelly bar (see Figs. 2 and 3). A heavy duty thrust swivel bearing is provided at the upper end of the Kelly bar to prevent twisting of the wire rope. The Kelly bar has a truss-shaped sliding yoke which fits inside, and is engaged by, the 32-in. diameter horizontal ring gear in the turn table. As drilling proceeds, the Kelly bar merely slides downward through the yoke until the bucket has filled. Fig. 2 shows the starting of drilling operations.

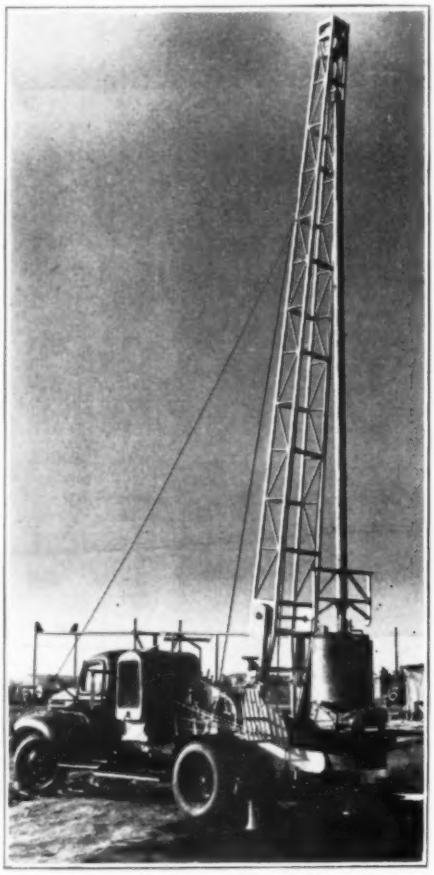


Fig. 3—Drilling Rig with 32-Foot Derrick Raised to Drilling Position

The single Kelly bar permits a maximum depth of hole of approximately 22 feet. Deeper holes can be drilled by splicing the Kelly bar to extra drill stems, but when this is done they must be taken apart each time the bucket is removed from the hole, which, of course, slows down the drilling speed at depths below 22 ft. and adds materially to the cost per foot. Fortunately, the depths of our proposed sewers are such that only a small number of our holes were deeper than 22 ft.

Standard drill-bucket sizes for this rig are 16 in. and 28 in. The buckets are provided with hinged bottoms containing two cutting knives. Leather or rubber flaps are used inside the bottom to hold soils that are likely to run or flow out of the bucket while it is being removed from the hole. The latch, holding the bottom in place, is released by a half-turn of a hand crank at the top of the bucket. Fig. 4 shows this hand crank on the bucket being emptied, after having been pushed clear of the rig.

Two men operate this rig under normal conditions.

Fig. 4—Emptying Bucket Pulled Clear of Rig

(Hand-crank for releasing bottom of bucket is visible at top of the bucket to left of the yoke.)

Drilling Technique

The drilling program, now to be described, was designed to yield sufficient information on the subsoil and ground-water conditions to permit the preparation of construction cost estimates for the Engineer's Reports, which are required in advance of the bond elections by California's County Sanitation District Act of 1923. For this purpose, a spacing of 1000 feet between holes was assumed to be adequate. Actually 141 holes were drilled along the 171,500 feet of proposed sewer line, giving an average spacing of 1220 feet. Depth of hole varied from 10 to 30 feet, the average being 16.3 feet. In general, the holes were drilled 3 feet below the invert of the proposed sewer.

The 16-in. bucket was used throughout the job except where rocks and boulders larger than 4 to 6 in. were encountered. The openings in this size bucket would not pass the larger rocks, and, therefore, it was necessary under these conditions to use the 28-in. bucket.

In clay, adobe, and damp coarse sand, the hole would stand for its full depth; but when fine sand, silt, or ground-water were encountered, the hole would start to cave in. Caving was rarely experienced at less than the 8-foot depth, the average being more nearly 12 feet. In order to hold the sides in place and to continue drilling in the "running" soils it was necessary to use an 18 in. steel

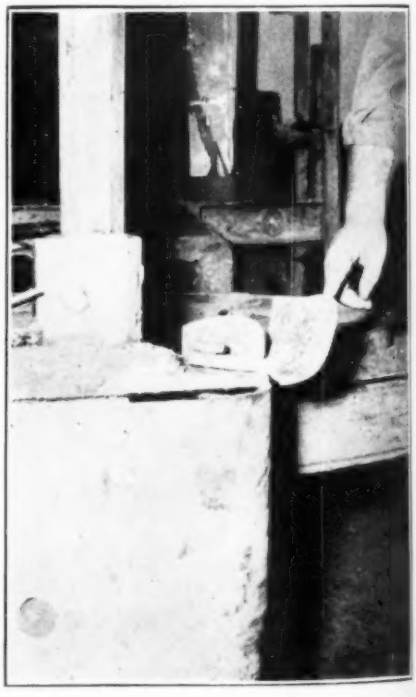


Fig. 5—Bucket with Reamer Fin Attached

(Reamer is employed to widen holes for steel casing if such is required to stop caving of hole.)

SUMMARY OF COST OF DRILLING
SOIL TEST HOLES

Item of Cost	Cost		
	Total	Per Foot Of Hole*	Per Hole*
Drilling rig with 2-man crew: 240 hrs. @ $10.00/hr.	$2,400.00	$1.04	$17.03
Steel casing, 18" diam., 2' lengths: 24' @ $5.82/ft.	139.68	0.06	0.99
Sample jars, pint, wide mouth, Kerr: 443 @ $7.82/C	34.64	0.02	0.25
Miscellaneous supplies (lath, flagging, planking, etc.)	26.21	0.01	0.19
Mileage and transportation	81.52	0.04	0.58
Sub-Total	$2,682.05	$1.17	$19.04
Engineering inspection and sampling	625.00	.27	4.43
TOTAL	$3,307.05	$1.44	$23.47

* Unit cost is based on following drilling record:

Total length of hole drilled	2302 ft.	Total drilling time	240 hrs.
Number of holes drilled	141	Average length of hole per 8-hr. shift	77 ft.
Average depth of hole	16.3 ft.		

casing in conjunction with the 16-in. bucket. When caving was encountered at the bottom of the hole, the bucket was pulled and fitted with a small reamer fin, as shown in Fig. 5, which enlarged the hole sufficiently to take the 18-in. casing. After reaming the hole down to the caving level, the bucket was removed, the casing was placed, and drilling without the reamer attached was resumed. The weight of the steel casing in the wet or running soil was sufficient to cause it to follow closely behind the bucket without further reaming. As the casing settled, additional 2-foot lengths were bolted to the top section. Naturally, it was just this type of subsoil that we were desirous of locating and determining the extent of, as sewer construction in such soil is the most difficult and expensive. Some test-hole drillers maintain and hold the sides of the hole by keeping it filled with rotary mud. However, in our work we avoided use of the mud, as we desired a "cleaner" sample than that obtainable from the admixture of soil and rotary mud.

Drilling was stopped wherever solid rock was encountered unless it was believed that the "rock" consisted of only a thin layer of shale, which type of structure is not uncommon in the bluffs along the coastal and beach areas. After piercing these thin layers of shale by repeatedly hoisting and dropping a heavy chuck bit into the hole, drilling was resumed in the usual manner with the bucket. Fortunately, very little true rock was encountered during drilling operations.

Although it was possible to backfill using a small blade or Fresno in conjunction with the hoisting drums, experience indicated that it could be done more quickly and efficiently by hand, the helper on the rig doing the job. This procedure allowed more efficient use of the rig in that it could be sent ahead for setup at the next hole. Compaction of the refilled hole was accomplished by driving a light truck back and forth over the filled hole a number of times. It was possible to locate all holes off the roadway, and, therefore, no resurfacing was necessary.

Holes were located a safe distance from overhead lines to avoid the possibility of snapping of the hoisting cables and contact with power lines.

In order to complete the work in the short time available, the rig was operated 16 hours per day for a total of 15 days. With proper lights available on the rig, night drilling was only slightly more difficult than day work. At night, every effort was made to select locations away from dwellings, as the noise from the rig was described to the Sheriff's office as "objectionable."

Sampling & Records

An engineer was assigned to the drilling rig at all times to keep the time records, to maintain the drilling log, and to take soil samples. Fig. 6 shows the Record Form for Soil Test Data, complete with the actual field data for Test Hole No. 22. As shown by the record for this hole, caving was encountered below the clay cap at a depth of 10.5 feet, and 18 feet of casing had to be set to complete drilling. Ground-water was encountered at 12 feet, and the engineer made the general note that difficult trenching and excavation would be experienced in this area.

Soil samples were taken wherever there was a change in the type of soil. A total of 443 samples were taken for the 141 holes drilled, or an

RECORD FORM FOR SOIL TEST DATA

Test Hole No: 22 Inspector: Sweet (Day shift) Date: 10-20-48

Location: BUSHARD ST. & ATLANTA AVE. (STA. 130+00)

Contractor: Gentry (Operator: Barber) Drilling Time: 6:20 - 8:20 a.m.

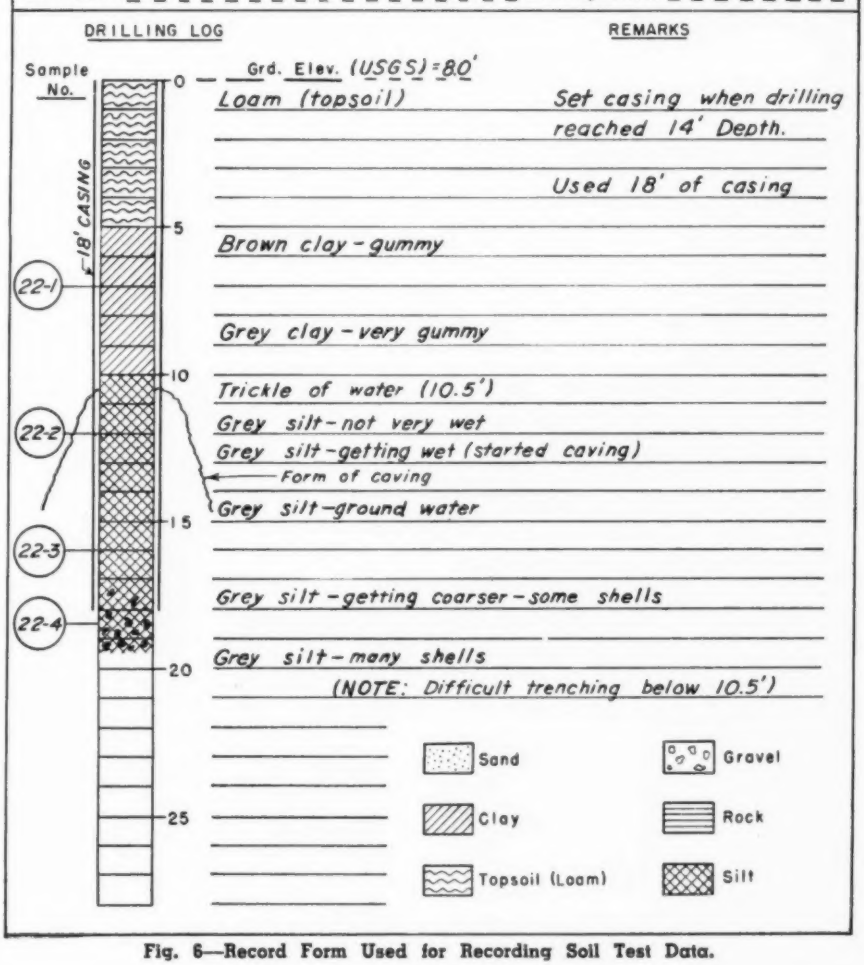


Fig. 6—Record Form Used for Recording Soil Test Data.

average of 3.1 samples per hole. These samples are preserved in sealed, pint (wide-mouth), fruit-canning jars, and they, together with the drilling logs, will be made available to all contractors when bids are called.

Fig. 7 shows the engineer taking a sample by reaching up into the bucket through the bottom openings, thus obtaining a truly representative sample. Sampling from the top of the bucket was not practiced, as often clods of soil would fall into the bucket as it was being removed from the hole.

Cost of Drilling

Cost of the drilling work is summarized in the accompanying table. The cost averaged $1.17 per foot of hole exclusive of engineering inspection and sampling, and $1.44 per foot including inspection and sampling. As will be noted, the cost of the drilling rig and crew constitutes the largest part of the total cost—approximately 72 per cent. Engineering inspection and sampling comprised 19 per cent of the total cost, and all other items made up the remaining 9 per cent. The 18-inch steel casing can be used on future drilling jobs. On small jobs where only a few holes are desired, the cost of the casing can be eliminated through the use of rotary mud to prevent caving. The cost of surveying and utility location has not been included as these items will depend entirely upon the characteristics and development of the area under consideration. No mobilization and demobilization charges were made by the contractor since his yards were very near to the job.

Fig. 7—Engineer Taking Soil Samples from Jaws of Bucket

(Samples are preserved in sealed pint fruit jars for later observation by bidders along with drilling logs.)

Ed. Note: On Feb. 28th voters in seven of the Sanitation Districts of Orange County, Calif., approved bonds in the amount of $8,308,000 to finance major sewage treatment and disposal facilities for the County. In the election the bond issue carried by a 7 to 1 majority, largely because the voters had been effectively informed concerning plans, costs and other pertinent matters connected with the proposals of the engineers responsible for the plans and cost estimates.

Drilling progress of 77 feet per 8-hour shift was somewhat slower than had been anticipated, and, therefore, the unit costs were slightly higher than expected. Since many of the "bugs" were worked out on this job, greater progress and lower unit costs are expected on our future jobs.

Summary

The soil-test-hole program, designed to furnish data on the subsoil and ground-water conditions along the routes of proposed trunk sewers, involved drilling 141 holes of an average depth of 16 feet at a cost of $1.44 per lineal foot. The work was done in areas wherein very little accurate information was available. Soil samples and drilling records indicated where excavation and trenching would be difficult and costly and where the various dewatering methods would be adaptable. The work indicated those trunks which had to be relocated or raised in grade, where this was feasible. It separated what can ordinarily be called "easy construction" from that involving considerable risk. The program served to eliminate much of the fear that accompanies uncertainty as to subsoil and ground-water conditions.

Gentry Cesspool Service was the drilling contractor. Charles A. Sweet and Walter E. Brelje served as engineering inspectors on the job. The photographs of the work were kindly furnished by Joseph C. Gallant of the Orange County Health Department and by California Welding & Blacksmith Shop of Los Angeles.

C. C. Agar Heads N. Y. State Water Pollution Control Section

Announcement has been made of the appointment of Charles C. Agar to the position of Chief of the Water Pollution Control Section of the New York State Department of Health.

In his new work Mr. Agar will have statewide supervision of the pollution survey and control work initiated and implemented under the Water Pollution Control Act passed by the 1949 State Legislature, and signed by Governor Dewey on April 20, 1949.

A graduate of Worcester Polytechnic Institute in 1920, Mr. Agar was first chemist and bacteriologist of the City of Worcester, and later research chemist at the City Sewage Treatment Works. In 1929 he became associated with the Sanitary Engineering Division of the N.Y. State Department of Health, with which he has been associated for the past twenty years. During the war, he rose to the rank of lieutenant-colonel, and was on General Patton's Headquarters Staff throughout the European Campaign.

Col. Agar has been active in the New York State Sewage Works Association, of which he was president in 1937, and from which he received the Kenneth Allen Memorial Award for research during that year.

Sam Morris Heads APPA

At the annual convention of the American Public Power Association held at Los Angeles, California, Samuel B. Morris, General Manager of the Los Angeles Water, Light and Power Department, was elected President of the Association for the ensuing year. Mr. Morris is a past president of the A.W.W.A.

REPORT ON A.W.W.A. TECHNICAL SESSIONS

Water Works Management Div., Water Resources Div. Committee Reports, and General Sessions All Draw Good Attendance

IN THE July issue of *Water & Sewage Works*, the story of the A.W.W.A. Convention in Chicago was told. That report covered the election of officers, the awards, entertainment and all of the general features of the meeting, which was the largest ever held in the history of the Association.

This report will be devoted to reviewing the technical papers presented before the Management Division and the Water Resources Division, as well as others presented before general sessions. It will be impossible to make a complete report in this issue and the review of the papers in the Water Purification sessions and some of the general sessions will be covered in the September issue.

Water Works Management Division Sessions

The opening session of the Water Works Management Division was presided over by W. Victor Weir, Vice President Elect of the Association, and President of the St. Louis County Water Co. Co-chairman at this session was Melvin P. Hatcher, Chairman of the Management Division, and Director of the Water Dept., Kansas City, Mo. The Associate presiding officer was H. R. Frye, Supt. of Water, Evanston, Ill.

HIGHWAY CONSTRUCTION POLICIES

In a panel discussion on **"The Effects of State Highway Construction Policies,"** L. W. Grayson, Supt., Dept. of Public Utilities, Riverside, Calif., reviewed the situation in reference to the State of California.

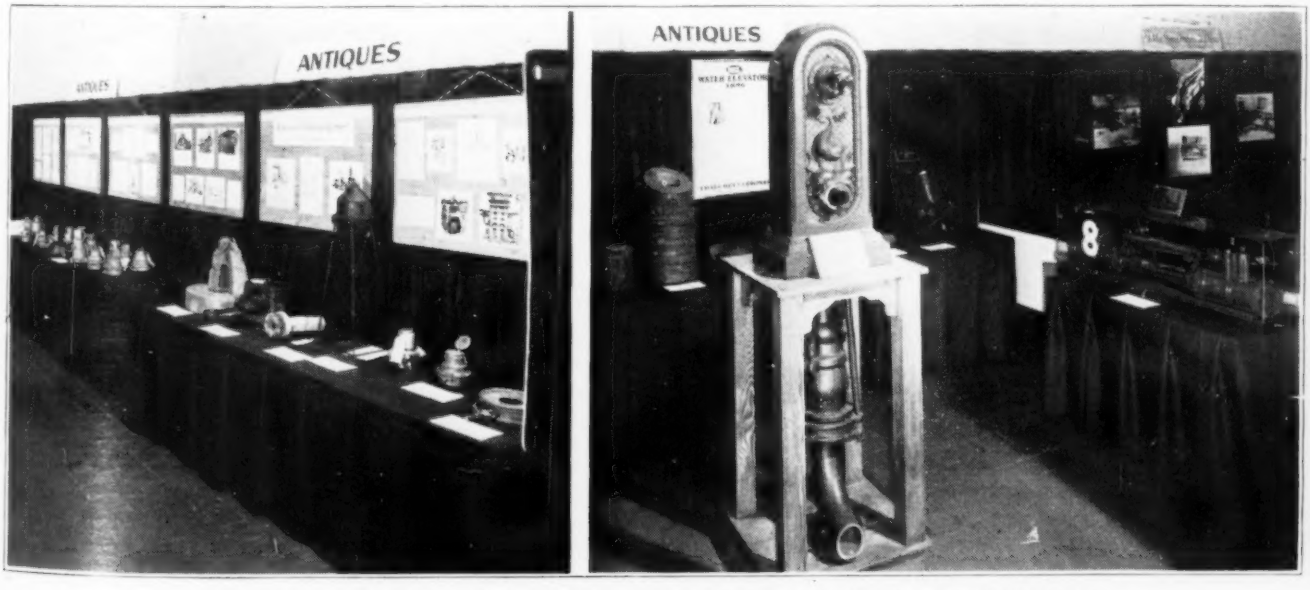
Under a Highway Act of 1947 the policy was established that utility occupations of freeways is reasonable to a degree, and, further, that public utilities will be given more aid than private utilities in any necessary construction occasioned by changing highways. If a utility has to move a pipe line twice in ten years, it is done by the State at no cost to the utility, and if a utility has a prior right to the right-of-way, this is recognized by the State and the State will pay for any change necessitated by a revision in the highway system. Mr. Grayson cited a case at Riverside, where the State paid $27,000 for the relocation of one mile of mains. This relocation was done only after a complete list of every possible factor involved was filed with the State.

The second speaker on the panel was William G. Banks, Div. Engr., Div. of Water, Dept. of Public Works, Newark, N. J. Mr. Banks stated that the New Jersey system was similar to that in California. New Jersey has a policy in reference to highways, freeways and parkways. A freeway is the same as a highway for through mixed traffic, but abutters have no access. A parkway is for traffic for non-commercial vehicles only.

The problem of highway construction is to construct the main and, at the same time, not interrupt traffic. Mr. Banks said that they use sleeves under highways. The cost of construction is borne by the utility, but when the State moves a highway, the State reimburses the utility if relocation of the main is required. If it is merely an improvement to the water works system, then the cost is borne by the utility.

Arthur C. King, Supt. of Water Works, Taunton, Mass., was the third speaker on the panel. Mr. King referred to maintenance problems, stating that utilities must have a permit to open new pavement, except in emergencies. In case a new highway is being laid and the main is being laid alongside, then the utility must plan to supply both sides of the road.

The cost of such a main installation is sometimes divided, except in the case of a private utility, which will do it at its own expense.



Some of the Many Antique Pieces of Water Works Equipment Displayed at the Exhibit Hall.
(Not shown—The piece of 1800 yr. old lead pipe from Rome described in our July issue.)

The most difficult problem is planing to carry out the work at the time required by the highway department. Highway plans are often made far in advance, but a water utility does not know just when a highway will go under construction. Usually a utility receives a request to do its main relaying on the spur of the moment. In such cases, equipment and materials are often not available and this causes considerable confusion.

During the questions and answers which followed, L. S. FINCH, Chief Engr., Indianapolis Water Co., asked if the state moves curb boxes. Mr. Banks of New Jersey replied that possibly there were not many customers along the highway, but that the state does pay for such transposition when it is necessary.

An annual report is not solely an advertising medium, but it should tell a story. While engineers see the importance of structures, they should also realize the need for eye-appeal; therefore the report should be designed to attract attention.

Mr. Mayer prefers the 8½ x 11 in. brochure, and he stated that it is essential that the information presented therein should be presented in a manner that is understandable to the public. It should include information on personnel relations.

Other material that should be included in an annual report is such factual information as is necessary to show the progress of construction programs. Mr. Mayer prefers that the report should be prepared in two parts, with the statistics in Part II, to be bound separately. Annual reports containing well developed statistics and the proper story, can be used to obtain new rates. Graphs should show ten-year periods. Among the items which should not be included in an annual report are the number of miles traveled by cars and other data of no useful value.

As to the part of public relations in annual reports and other publications, Mr. Mayer cited the case of their Garden Pamphlet, which is issued with the water bill at Los Angeles. While this pamphlet does not sell more water, it does make fine relations with the public.

During the course of the discussion which followed this paper, M. P. HATCHER, Dir. Water Dept., Kansas City, says that there is now a committee working on annual reports and they are agreed that these reports should be short. In reply to another question, Mr. Mayer said that it paid to have a special man to do the job. GERALD ARNOLD, Dir., Water Dept., San Diego, Calif., said that their report is made up in five sections and combined. ROBERT MILLAR, Mgr., Wichita Water Co., mentioned the advisability of putting an abstract of the annual report in the Sunday papers as a supplement. DR. GEORGE E. SYMONS, Assoc. Editor, *Water & Sewage Works*, spoke on the relation of annual reports to public relations and the need for good contacts with the newspapers and for making the report attractive in itself. WENDELL LADUE, Supt., Water & Sewerage, Akron, Ohio, pointed out that, in preparing an annual report, it is necessary to consider the audience which will read it. For a private company, the audience might be the stockholders; for the public utility, the audience would be the consumers.

W. V. Weir
President
St. Louis Co. Wtr. Co.
St. Louis, Mo.

M. P. Hatcher
Director
Water Dept.
Kansas City, Mo.

L. R. Howson
Cons. Engr.
Chicago
Ill.

W. R. La Due
Supt. & Ch. Engr.
Water & Sewerage
Akron, Ohio

Presiders At Sessions

Reeves Newsom
City Mgr.
Scarsdale
N. Y.

G. E. Arnold
Director
Water Dept.
San Diego, Calif.

INSURANCE PROTECTION

The third part of the session was devoted to a panel discussion on **"Types of Insurance Protection for Municipal Water Departments."** The first speaker on the program was Charles G. Bourgin, Supt. Montclair Water Bureau, Montclair, N. J. Mr. Bourgin spoke only in reference to damage claims from breaks in mains or undermining. He pointed out that there are four operator attitudes towards insurance for this type of damage. These four include the operator with no protection, the operator who believes, falsely, that the public utility is immune from suit, the operator who has given consideration to insurance, but prefers to carry his own, and the operator who carries insurance against damages.

Water utilities, even though they may be publicly owned, are considered a proprietary function of the city, and are therefore suable. Thus, it is obvious that water departments are liable for damage.

Among the operators who have given consideration to insurance, but prefer to carry their own, are those who believe that good operation will prove that there has been no negligence. There are also those who simply rely on the city to scare off suits. Mr. Bourgin believes that there is a limit to the size of the claim above

LEONARD THOMPSON, Supt. of Water, St. Paul, Minn., asked if the state recognized engineering costs, or just recognized cost of construction. Mr. Grayson of California stated that in California the costs include engineering costs. Mr. Grayson further stated that in California the state does not pay for relocation of meters within a state highway.

MUNICIPAL REPORTS

Under the title, **"Making Municipal Reports Interesting,"** E. B. Mayer, Exec. Engr., Dept. Water & Power, Los Angeles, Calif., reviewed the whole subject of the preparation of annual reports. Mr. Mayer first asked what is an annual report and why is it printed. As to what it is, he stated that it is composed of a compilation of drafts, diagrams, and tables to illustrate the operation of a water department. As to why an annual report is printed, Mr. Mayer suggested that it is a legal record—it is a diary of what has been done—and it is good public relations. Such a document should be well edited and published as an engineering publication.

which certain insurance is not sufficient, and he believes that utilities should carry catastrophe insurance.

For those who carry insurance, there may be either complete coverage, or self insurance up to a certain limit, with insurance for any damages above that amount. The type of insurance used is a contractor's or manufacturer's insurance, or a manufacturer's product liability insurance. Premiums are usually adjusted on the basis of a 5-year experience record. Catastrophe insurance allows a 15 per cent rebate when there is no settlement.

After citing examples of several types of main breaks, all of which cause damage, but some for which payment of claims was not necessary, Mr. Bourgin concluded with the statement that, in the opinion of the courts "there is no difference between a public and a private utility and therefore every utility should carry contractor's insurance; large companies can self-insure to some degree, but small utilities should carry complete insurance."

ROY O. ELLIS, Mgr., Municipal Water Dept., Oskaloosa, Iowa, was the second speaker on this panel. Mr. Ellis told about Oskaloosa being used as a test city where five insurance companies are sponsoring a program to study the needs for insurance and the rates of insurance. Studies are being made on pumps, pumping station, filter plant, office building and contents, and, lastly, on elevated storage tanks. Oskaloosa was selected because it is in a storm area and has been subject to a number of burnouts from lightning damage. One year the loss was $28,000; in a flood year another loss was $17,000. For the past year and one-half there has been no loss. The results of this study are not yet available, but Mr. Ellis is of the opinion that a water utility should carry and can afford to carry insurance. The cost of such insurance is coming down. At the present time the base rate for the first three items mentioned is low, but insurance on elevated storage tanks is still high. This study includes a tank inspection every six months. It is hoped to set up a sliding scale as the tank grows older. A complete report will be available in 1951.

The third speaker on the program was ELMER C. SCHWIER, Secy.-Treas., Indianapolis Water Co., Indianapolis, Ind.

Mr. Schwier spoke about nuisance claims, with particular reference to valve boxes and curb boxes. In Indianapolis, the Water Co. does not own the boxes or the services, but since 1930 they have had the responsibility of upkeep from curb box to the main. There have been 57 curb box claims since 1931. It is obvious from these claims that persons can trip over low boxes and even those not in sidewalks. Accidents usually occur in the early evening, when there are no witnesses.

In the same period of time there have been 39 claims for damage from tripping over meter pits. These are all on private property and a few of the claims have been paid. There have also been nine claims for falling over fire hydrants.

Out of a total of 107 claims, the distribution of the accidents over periods of six years each shows that there were more claims toward the end of the depression, except in the case of meter pits. With a program of curb box maintenance, there have been fewer claims for damages since 1941. Some of these cases have been settled for as little as $15 and others have cost up to several thousand dollars. Each case requires its own study and report, regardless of the size of the claim, because it can be expensive.

Mr. Schwier says that the number of accidents for box or meter valves is small, but all are potential accident causes. People are becoming more conscious of the possibility of collecting insurance, apparently, concluded Mr. Schwier.

In reply to a question, the speaker stated that at Indianapolis the insurance policy covered everything from $100,000 to $1,000,000.

In discussing the paper, VICTOR WEIR, Pres., St. Louis County Water Co., remarked that to insure an elevated tank it is necessary to take out a fire policy and to obtain an extended policy coverage. Mr. Ellis replied that the insurance companies are trying to eliminate that type of policy and, following the study at Oskaloosa, will have a new type policy for elevated tanks.

AIR CONDITIONING

At the second session of the Water Works Management Division, Melvin P. Hatcher, Dir., Water Dept., Kansas City, Mo., served as chairman. Gerald D. Arnold, Dir., Water Dept., San Diego, Calif., served as co-chairman; and C. M. Roos, Mgr., East St. Louis Water Co., East St. Louis, Ill., was associate presiding officer.

The first paper in this session consisted of a committee report on **"Regulation of Water Use for Air Conditioning,"** presented by Frank C. Amsbary, Committee Chairman and Mgr., Illinois Water Service Co., Champaign, Ill.

Mr. Amsbary pointed out that this was a tentative committee report, and that it was a policy adopted on the basis that some action should be taken towards stimulating water conservation now, before the problem of air conditioning bursts upon the industry. One other consideration which the committee discussed was the fact that refrigeration is essential where the temperature of the water is above 60 degrees.

The committee does not believe in the prohibition of air conditioning equipment, and believes that conservation of water is necessary only where refrigeration is practiced and in the

W. G. Banks
Div. Engr.
Div. of Water
Newark, N. J.

A. C. King
Superintendent
Water Works
Taunton, Mass.

F. C. Amsbary
Manager
Ill. W'tr. Serv. Co.
Champaign, Ill.

L. S. Finch
Ch. Engr.
Ind'p'lis Water Co.
Ind'p'lis, Ind.

C. H. Capen
Ch. Engr.
No. J. Dist. Wat. Sup.
Wanaque, N. J.

A. R. Davis
Superintendent
Water Dept.
Austin, Tex.

Program Participants

larger units. Water conservation units save 95 per cent of the water; they have a higher first cost and a higher power cost, but actually save in the cost of water. The committee considered the following points: Whether there should be a surcharge, if no conservation were practiced; whether the customer should be appealed to; or whether there should be a requirement of conservation.

It is recognized that a surcharge is discrimination at a price. No two communities have the same problems and, therefore, in any community, the situation needs careful consideration. Air conditioning is no longer a luxury, and should not be fought by water departments unless it puts a strain on the water plant. The committee does not recommend separate meters, because they are expensive and impractical. The committee believes that the utility should help the consumer, but should not accept the problems of the industry. There are certain things which must be considered: The effect on makeup water, the health angle,—that is, water should not be returned to the systems—and requirements that all customers should take out permits and report the installations.

The committee also makes a tentative suggestion that makeup be limited to 0.1 gpm. per ton, if the water is 10 grains of hardness or less. Tentative penalties might include charges on horsepower, or discontinuance of service, if there is no cooperation, or billed-for water at the basic rate, but penalized in summer. These are only suggestions that have been made; they are not a recommendation of the committee. Even at the 10 to 15 gpm. upper limit mentioned, the use of one of these units is 50 times that of a normal customer. The committee requested written comments about the problem.

One of the members of the committee was Mr. Lewis, Vice President of the Carrier Corp., who represents the industry. Mr. Lewis stated that he wants proper regulations developed "to make the whole thing work."

Victor Weir, Pres., St. Louis County Water Co., St. Louis, Mo., stated that he believed the whole problem is one of water conservation—particularly how to hold down a peak load. When a customer's use in four months is twice that used in the other eight months then it does not seem reasonable that the customer should have the benefit of a low rate. Samuel Morris, Gen. Mgr., Los Angeles Water, Light & Power Dept., believes that a carefully constructed rate schedule is the answer to regulations, and Marsden Smith, Chief Engr., Public Util. Dept., Richmond, Va., believes that the idea should be to protect the man with the short supply. S. T. Anderson, Supt., Water, Light & Power, Springfield, Ill., said that in some cases customers use 100 times as much water in the summer as for the rest of the year. In a case like this, they are given the rate of one-fourth the summer peak rate for the year.

J. C. Detweiler
Manager
Water Oper.
Omaha, Neb.

D. D. Gross
Ch. Engr. & Supt.
Water Comm.
Denver, Colo.

C. M. McCord
Director
Water Dept.
Memphis, Tenn.

W. C. Morse
Supt.
Water Dept.
Seattle, Wash.

C. H. Bechert
Dir. Div. Water
Ind. Dept. Consv.
Indianapolis, Ind.

H. T. Critchlow
Ch. Engr.
State W'r'r Pol. Com.
Trenton, N. J.

More Program Participants

WATER MAIN EXTENSIONS

Speaking for the committee on **"Water Main Extension Policy,"** L. S. Finch, Committee Chairman and Chief Engr., Indianapolis Water Co., Indianapolis, Ind., stated that he was making a progress report. This committee was the outgrowth of a panel discussion on this topic, held in San Francisco in July, 1947. The problem of how to finance the water main extensions is an old one and there is as yet no general solution. It was first discussed in 1910 and there are still the same problems.

Mr. Finch said that among other things, there should be comprehensive rules developed for water main extensions, but that these rules should be reviewed periodically. They should consider such things as the ownership, decision on pipe size to be left to the utility, whether or not there is a special assessment and its relation to revenues, and the matter of free limits set by law. Mr. Finch quoted from several authors to show suggested considerations regarding the policy for water main extensions, and he pointed out that main extensions make necessary certain additions to the production equipment. This is often not considered in determining the cost of water main extension.

Where water main extensions are due to real estate developments by promoters, the promoter should pay for the excess cost over and above the free limit. Refunds to the promoter can be made from revenue received.

In the appendix to the committee report, the committee discussed the steps necessary to obtain the necessary monies to pay for water main extensions. Method A consists of anticipated revenue, or expenses of the utility, where known. It is possible to determine how much should be spent for extensions for a given expected return. Method B is to determine the amount to be expended on the basis of the present ratio of investment per dollar revenue. Some persons believe that contributions by the promoters are desirable; some do not. Other persons believe that private mains should be allowed and still others do not.

Samuel Morris, Gen. Mgr., Los Angeles Water, Light & Power, Dept., says that Method B is weak, because of rising costs. In Hartford, Conn., the method is to base the extension on the average cost of 8 in. pipe for the last five years. Assessments are made to the property owners and they are allowed four years for payment. At the present time, it is approximately $2.63 per ft.

DIVERSION OF WATER FUNDS

With Wendell R. LaDue, Chief Engr., Bureau of Water & Sewerage, Akron, Ohio, acting as Moderator, a panel discussion was held on the subject, **"Diversion of Water De-**

partment Reserve Funds." In opening the panel discussion, Mr. LaDue commented on taxation versus diversion. He pointed out that in recent years it has become apparent that a water department which is efficiently operated to produce surplus or reserve funds finds itself on the defensive to protect those funds for their proper use. Many an old time water works man gets fighting mad at the mention of "diversion of water works funds," but many persons today realize that the water works is a part of the municipal family and that it is proper to aid other departments. Mr. LaDue cited an instance in Ohio to show that "People get and do what they want, good or bad." In Ohio, during the depression, the Legislature acted to allow 3 per cent of water works funds for poor relief, and 5 per cent of reserves for sewer systems, where water and sewage systems are under combined management. In the latter case, the water works must come first, and only diversions to the sewer department can be made, after water works cost of operations are paid. Furthermore, not more than 10 per cent of the gross revenue can be deducted.

In opening the panel, Mr. LaDue further stated that at least six questions were presented to be answered —these six questions being (1) What are the existing practices and what part does customer precedent dictate; (2) Does there exist satisfactory enabling or restrictive regulations; (3) Is the trend toward more diversion or less diversion of water works funds; (4) Does there exist a clear definition of surplus, profits, or reserves; (5) Are the needs of water works as going concerns protected, so that they receive necessary funds to keep them as going concerns; (6) In case of known diversion practice, what is the effect of such procedure on sound future planning?

The first paper on the panel discussion was by E. Arthur Bell, Essex Fells, N. J., and presented by CHARLES H. CAPEN, Chief Engr., North Jersey Dist. Water Supply Comm., Wanaque, N. J. Mr. Bell's paper first defined reserve funds as "those monies which come after all normal expenses are met for operation and capital debt service." From a survey of the eastern area of the country, it is apparent that there is no uniformity of definition or of action regarding diversion of water works funds. New York has an enabling act, which treats a public utility the same as a private utility. New Jersey has no such act, but, like Pennsylvania, has a number of regulations. In some cases water works draw on a general fund, and in some cases the opposite condition exists. It appears to be more or less common practice for water works funds to be diverted to some extent, and the trend in this direction seems to be affected by the economic situation. When there are plenty of taxes available, there is little diversion; furthermore, there is not much surplus in the water works reserve account now, because of the high cost of operation.

ALBERT R. DAVIS, Supt., Water Dept., Austin, Texas, speaking for the southwest section of the country, said that the diversion of funds is more the rule than the exception. There is a wide range of statutes governing this matter in the southwest. At the present time costs of operation are up so far that funds are not enough to create a surplus. There is generally no clear cut definition of surplus or reserves; at least, there is no standard definition. Conditions seem to be better where commissions exist. Mr. Davis says that the water works are protected insofar as their needs as going concerns are evidenced. In some cases, surplus funds are being used for planning.

JOHN C. DETWEILER, Mgr., Dept. of Water Operations, Omaha, Neb., spoke for the north central areas. In general, it would appear that there is no serious condition existing in that area from diversion of water works funds. Those cities having the most difficulty are the ones where monies are paid into the general fund. Where there is a separate board of works or commission, operations are without difficulties in regard to water works funds diversion.

D. D. GROSS, Chief Engr. and Supt., Board of Water Commissioners, Denver, Colo., spoke for the Rocky Mountain area. He mentioned that in some instances regulations were circumvented by borrowing and that the borrowing was not paid back. Conditions in Arizona are different from those in Montana. In fact, there can be no general statement made for the area. Mr. Gross said that it is not fair to collect money from one and use it for others. Civic benefits are more directly reflected in taxes than in water bills and he believes that water works funds should be protected against diversion.

C. M. MCCORD, Dir., Water Div., Memphis, Tenn., spoke in reference to the Tennessee, Kentucky, Mississippi and Alabama areas. It appears that the custom, or precedent for water works funds diversion is less significant there than perhaps elsewhere. There is no restrictive legislation and the trend would appear to be towards less diversion. It appears that the local situation is the guiding, or limiting, factor.

W. C. MORSE, Supt. Water Dept., Seattle, Wash., spoke in reference to the northwest area, pointing out that there is a great diversity of attitudes among the various cities in that area. Some municipal water departments work like private utilities. In some cases excess funds are divided with the city funds, just as a private company would declare dividends. In Seattle, the need for more funds in the city was met by increasing the

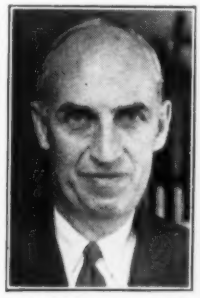
F. W. Kittrell
Chief
Str. San. Sect.
T.V.A.
Knoxville, Tenn.

H. E. Hudson
Head
Eng. Sub-Div.
Water Survey
Urbana, Ill.

Also Programmers

C. B. Brown
Sed. Specialist
Soil Consv. Serv.
Dept. of Agr.
Washington, D. C.

A. M. Buswell
Chief
Ill. State Water
Survey Div.
Urbana, Ill.



L. A. Smith
Supt.
Water Works
& Sewerage
Madison, Wisc.

S. B. Morris
Gen. Mgr. &
Ch. Engr.
Dept. Wat. & Power
Los Angeles, Calif.

Photo by Tom Driskell

Hayseed Hullabaloo! ! !

(Swing your partners and a Do-ce-do—Recognize Anyone?)

water rates and then turning the extra monies received over to the general fund. About 32 per cent on the average, for the past ten years, of the water rates, has been turned into the tax account. Mr. Morse says that the one fear about this method is that the freedom to divert funds is an invitation to increase water rates, but there is a check of the governing body, if this diversion goes above an arbitrary requirement. Furthermore, the diversion can only be made after all water system betterments are provided for and debts and replacements are paid for the current year.

Following the panel presentation, there was considerable discussion from the floor and one concrete suggestion made was that a committee be appointed to study this problem.

WATER RESOURCES DIVISION

The first session of the Water Resources Division was devoted to an open forum on "CURRENT DEVELOPMENTS IN GROUND WATER LAW." The forum was opened by R. M. Legette, Consulting Ground Water Geologist, New York City, Chairman of the Division. Seven persons from six states took part in the panel discussion. The following report is based on notes taken by GEORGE E. FERGUSON, Secretary of the Water Resources Division. Some of the points which were set up for the participants to consider in their statements included the following: (1) What period of time the laws have been in effect or in a state of proposed legislation; (2) Basic authority or power of the state in control of ground water; (3) Adequacy of the law to meet problems existing today; and (4) Reaction to the law; that is, attitudes of the drillers and the public.

The open forum brought forth a helpful exchange of ideas by representatives from several states. Discussion from the floor which followed indicated that more than 100 members in attendance considered the topic of vital interest. The questions raised were answered from the platform, largely by the men who had presented formal statements, following their introduction by Chairman Legette.

Common Law Rights governed all litigation over the use and diversion of ground water in Indiana until 1947, according to CHARLES BECHERT, Dir., Div. Water Resources, Indiana Dept. of Conservation. In that year initial legislation was passed for future control of ground water use. The withdrawal of over 200 gpm. for air cooling or conditioning was prohibited, unless it is circulated and reused, returned to the ground, or a permit obtained from the Department of Conservation for use. No penalty is provided for violation, nor has any attempt been made toward enforcement since the legislative bill restricts the use of ground water for specific purposes. The constitutionality of this bill is open to question. A broader control was contemplated in a bill which failed to become law this year, probably because of insufficient time on the legislative calendar, rather than opposition to it. The highlights of this latter bill were the designation of "critical" areas, penalties for violation, and the inclusion of ground water used for all purposes.

The second speaker on the panel was HOWARD T. CRITCHLOW, Dir., Div. of Water Policy and Supply of the New Jersey Department of Conservation and Economic Development. Mr. Critchlow stated that his agency has control of public and potable ground water supplies under a law passed in 1910. In 1947 legislation gave the New Jersey Department of Conservation authority to delineate so-called "protected" areas, where diversion exceeds natural replenishment. It also required permits from the Division for the construction of wells over 100 ft. deep and the licensing of well-drillers. In the interest of conservation, water used for air conditioning and cooling must in the "protected areas" be returned to the ground through recharge wells.

The next speaker was J. C. THOMPSON, Exec. Engr., who, with A. H. JACKSON, Assoc. Engr. of the N. Y. State Water, Power and Control Commission, discussed the administration of the 1933 Section of the Conservation Law in New York State, which placed ground water resources from Long Island counties under the Commission's jurisdiction. This legislation was brought about by salt water intrusion of the lower, natural underground reservoir, which is the major source of water supply for more than 5,000,000 persons in those counties. New wells with pumps having a capacity of more than 100,000 gpd., were prohibited unless the water is returned, uncontaminated, to the underground basin. Under another section of the law, passed in 1935, local well drillers are licensed and must submit reports preliminary to and upon completion of each well. This completion report includes a well log.

Ground water used in Kansas is controlled under the Appropriation Act of 1945, according to GEORGE S. MATT, Chief Engr., Div. of Water Resources, Kansas State Board of Agriculture. The administration of this act is, however, related to court decisions based on the common law of England, according to the speaker,

who stated that the acquiring of rights to water for other than domestic use is by application only.

A certificate of appropriation is issued following examination of the completed project. Right of appropriation terminates after three years of non-use. An appropriator of water, under the Act, may be held liable, in the event of any injury to any common law claimant, but he has the right of injunction over subsequent diversions by common law claimant of private rights, and also over those having later rights of appropriation.

A review of the situation in Ohio was given by RALPH J. BERNHAGEN, Chief Geologist of the Ohio Water Resources Board. Mr. Bernhagen stated that there has been no recent ground water legislation in that state. The well drillers have been required to report logs of industrial and municipal wells since 1945, on a basis of a regulation of the Ohio Water Resources Board, which was created in 1941.

Since 1947 the logs of all water wells are required to be filed with the Board. A large amount of valuable basic data is thus becoming available inasmuch as about 5,000 well logs are being received each year. Further regulations dealing with contamination were set up in 1945.

Dr. F. H. Cathcart, Dir., Bureau of Topographic and Geologic Surveys, Penna. Dept. of Internal Affairs, was unable to be present. In his place, Chairman Legette called upon J. B. GRAHAM, U. S. Geological Survey, Dist. Geologist for Pennsylvania. Mr. Graham stated that no concerted effort was made by the state towards ground water legislation until last year. Two bills were introduced separately at recent legislative sessions, but neither became law. One was known as the Well Drillers' License Act and would have required drillers to file well logs with the state. The other bill termed the Ground Water Use Act called for users of ground water (all farm and domestic wells and all other wells less than 50 gpm. capacity were excepted) to declare their use to the state. In addition, it set up procedures for studies which would reveal the areas in which conservation of ground waters was needed. It further gave the right to establish such conservation areas in which no diversion greater than 50 gpm. could be made without state permit.

Speaking from the floor, DR. A. M. BUSWELL, Chief, State Water Survey Div. of Illinois, Urbana, Ill., said that his state was considering legislation that was somewhat similar to that of several of the other states under discussion. It would create an administrative and control board, which would provide for the designation of control areas following studies and hearings and would exercise some control over drilling. The use of the term "critical" area was questioned by Dr. Buswell as possibly being objectionable to industry, and that "control" area may be preferable in some states.

The practice of exclusion of smaller wells in ground water legislation was defended by Mr. Critchlow of New Jersey as being necessary in facilitating passage of the control legislation.

The view prevailed among the speakers that control should be at the state or lower level, but that municipal areas were often not sufficiently large to serve as limits for control areas. Both during the formal papers and following discussions, the idea was stressed that the collection of adequate basic data was a prerequisite, not only to the delineation of "critical" areas, but also often for the administration of existing legislation or for the design of new legislation. There was some objection raised from the floor to the tendency to single out the use of water for air conditioning for restriction.

Photo by *Western City*

Honorary Memberships

(Left to right—M'Kean Maffitt, Supt. (Retired) Wilmington, N.C., L. H. Enslow, Pres. A.W.W.A., and Thos. L. Amiss, Supt. of Water & Sewerage, Shreveport, La.)

Effect of Impoundages in TVA

At the second session of the Water Resources Division, Mr. Legette again acted as Chairman, with L. W. Grayson, of Riverside, Calif., acting as co-chairman. The following review of the papers presented at this session was made by F. W. Kittrell, Chief, Stream Sanitation Section, TVA, Knoxville, Tenn.

The first paper on the session was presented by F. W. THOMAS, Pub. Health Engr., in charge of Environmental Sanitation of TVA, Wilson Dam, Ala. The paper, titled **"Effects of River System Development on Quality of Water Supplies in the Tennessee Valley,"** was authored jointly by Mr. Thomas and F. W. Kittrell, Chief, Stream Sanitation Section, TVA.

Quoting the policy of the A.W.W.A. on national water resources, which recommends that "First authority for water resource development be afforded to beneficial consumptive use . . . of water for domestic and municipal purposes," Mr. Thomas pointed out that no comparable priority was assigned in the act creating TVA. TVA has made reimbursements on replacements for physical structures for 15 water works systems, serving 167,000 persons, affected by its river development program. The estimated cost is $885,000. Many of these adjustments have resulted in better physical structures, sanitary protection and improved water quality. The Federal Government recognizes no responsibility for damage to physical structures located in navigable channels and, consequently, one town has had to relocate its water intake at its own expense.

Likewise, the government is not liable for deterioration of water qual-

ity following impoundage, even on a non-navigable stream, unless it accompanies taking a property. The quality of sources of water for 37 public water supplies serving 390,000 persons has been affected in varying degree by impoundage. Some of these effects are noted in the reduction of 80 per cent in the raw water coliform organisms at Knoxville and a reduction in plate counts of 97.5 per cent at Chattanooga, following impoundage. Despite reductions of 61 and 78 per cent in turbidity at Knoxville and Chattanooga, respectively, siltation studies indicate that most of the reservoirs will require from one to four thousand years to fill with silt.

Reductions in alum requirements at three towns have amounted to from 11 to 28 per cent. Chlorine requirements have also been reduced. Chemical costs are 18 per cent less at Knoxville and 17 per cent less at Chattanoogo, since impoundage. Taste and odors have caused difficulties at five plants.

Land Use and Siltation

Moderator for the open forum on **"Effect of Land Use on Siltation of Reservoirs"** was HERBERT E. HUDSON, Head, Engrg. Sub-Div., State Water Survey, Urbana, Ill. Mr. Hudson pointed out that siltation starts near the upper end of reservoirs where it is often unnoticed until damage has been done. In Illinois about 500 out of 1000 possible reservoir sites have been developed at a cost of approximately $500 per million gallons of storage. These reservoirs are losing from 0.8 to 2.5 per cent of their storage capacities annually.

Engineers have not known how to evaluate the effects of siltation in selecting reservoir sites. Hudson suggests the ratio of reservoir storage capacity to watershed area as a simple but useful index. A low ratio would indicate siltation to be high and vice versa. Land use exerts an important effect on siltation rates.

CARL A. HECHMER, Dept. Engr., Maint. and Oper. Dept., Washington Suburban San. Dist., Hyattsville, Md., said that their first efforts were devoted to tree planting around the margins of the reservoir, but subsequent investigations led to the conclusions that other types of land cover would accomplish better erosion control and greater yield of water, i.e. strip and regular cover crops such as hay, grains and pasturage. Soil erosion control programs have been established in two counties with the Commission contributing $5000 a year to encourage private land owners to undertake control measures.

It has been concluded that a principal source of silt is unprotected shoulders, cuts, and fills along roads, and the cooperation of the highway department is being sought.

Picnicking is allowed at two designated areas; hunting is not allowed; some timber has been sold; and all watershed property is fenced and firebreaks are provided.

Watershed Protection

The watershed protection and reservoir silting program of the Soil Conservation Service, U.S. Dept. of Agr., was described by its Sedimentation Specialist, CARL B. BROWN, Washington, D.C. There are nearly 3,000 reservoirs, serving 30,000,000 water consumers. These would cost about one billion dollars at present prices. A 1941 survey of 150 reservoirs indicated that more than one third were losing at least one per cent of their capacities annually because of siltation. Highest rates of siltation are in the mid-west. At that time it was estimated that 21 per cent of the reservoirs would last less than 50 years. Now it appears that one third will fill in 50 years and many will be useless in 20 to 25 years. Replacements will be costly because the best sites have already been developed.

Confining his discussion to agricultural practices for preventing silting, Mr. Brown said that from 2.5 to 8.0 per cent of all land should be retired from row cropping and placed in complete cover crops. Contour plowing reduces erosion an average of 73 per cent, strip grass planting 93 per cent and terracing 85 per cent. Mr. Brown cited comparative figures for Lake Decatur, Ill. and Lake Waco. In the former, siltation increased from 1.0 to 1.2 per cent in ten years due to an increase in row cropping while at Lake Waco, the siltation rate was reduced from 3.6 to 2.06 per cent by retiring 20 per cent of the land from row cropping to pasturage.

WENDELL R. LA DUE, Chief Engr. and Supt., Bur. of Water and Sewerage, Akron, Ohio, has made a personal approach to the problem of watershed protection by covering the 900 sq. miles of watershed in car and on foot. The Bureau sets a good example for inhabitants of the watershed by demonstrating good farm practices on its own property, including mechanization, crop rotation, contour plowing and grass strips. More than three million trees have been planted since 1922. Conifers are planted around the reservoir to avoid leaf problems and deciduous trees including sugar maples are planted away from the reservoirs.

Mr. La Due concluded with the statement that water works men must become conservationists in order to protect their own selfish interests.

Fire Control

Fire control and grazing practices on watersheds were discussed by JOHN S. LONGWELL, Chief Engr., and Gen. Mgr., East Bay Municipal Utility Dist., Oakland, Calif. Because the 75 sq. mi. drainage area has little rain in the summers, fire protection is important. By increasing the amount of fire control equipment to include radio controlled jeeps, fires have been reduced to a very low rate. Tree planting is taking place at about 100,000 a year, and many erosion control projects have been completed. Carefully selected areas are leased for farming and grazing. The cooperation of the Soil Conservation Service on watershed protection has been helpful.

WATER WORKS PRACTICE COMMITTEE

With L. R. Howson, Consulting Engineer of Chicago and Chairman of the Water Works Practice Committee, presiding at the session, that committee held an open session at which deep well pumps and lubricants were discussed.

P. H. BROWN, Chief Engr., Johnston Pump Co., Los Angeles, Calif., spoke about **"Proposed Standards for Deep Well Turbine Pumps,"** saying that such standards will be helpful to both the buyer and the seller. Mr. Brown's comments stemmed largely from work done by the Mechanical Engineers Section in Southern California. This group has proposed that the A.W.W.A. and A.S.M.E. should write the specifications which might then become an A.S.A. standard.

Following considerable discussion from the floor about sanitary features, interchangeable parts, thrust bearings, etc., HARRY JORDAN, Exec. Secy., A.W.W.A., announced that the American Standards Assn. had approved the project to develop standards for deep well pumps, and that the A.W.W.A. would be the sponsoring agency, with other interested parties and organizations being associated with the project.

L. E. Ordelheide, Dir., Sect. on Environ. Health, Mo. Dept. of Health, Jefferson City, Mo., gave a survey report on **"Effects of Pump Lubricants Upon Quality of Water."** In Missouri where 60 per cent of the water supplies are from wells, the Health Department has made certain recommendations. As to proper lubrication, Mr. Ordelheide queried a number of health departments and

found that most of them have no definite policy, five approve only water lubrication, while four stated that they preferred water lubrication but would admit oil lubricated bearings.

A study of 134 wells in Missouri showed that 51 or 38.8 per cent have water lubricated bearings, while 83 or 61.2 per cent have oil bearings. Over a period of nine years, 4861 samples have been collected from these wells with 36.2 per cent of the samples being taken from wells with water lubricated bearings, and 63.8 per cent from the wells with oil bearings. Results of bacteriological studies showed that 1.85 per cent of the portions from the wells with oil bearings were coliform positive, while 1.87 per cent of the portions from the wells with water lubrication were coliform positive.

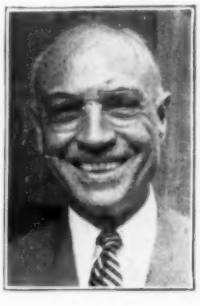
Malcolm Pirnie
Cons. Engr.
New York
N. Y.

W. F. Rockwell
Chmn. of the Bd.
Rockwell Mfg. Co.
Pittsburgh, Pa.

C. G. Bourgin
Supt.
Water Bur.
Montclair, N. J.

G. H. Ferguson
Wtr. Res. Branch
U.S.G.S.
Washington, D. C.

J. B. Graham
Dist. Geol.
U.S.G.S.
Harrisburg, Pa.



N. T. Veatch
Cons. Engr.
Kansas City,
Mo.

Some Programmers—Some Discussors

On the basis of these results it appears that the type of lubrication used for pump bearings has no effect on the bacteriological quality of the water supply.

In the discussion from the floor, controversy was apparent between MR. BROWNELL of the Minnesota Dept. of Health, where only water lubricated bearings are allowed, and others who use oil lubricated bearings. L. J. ALEXANDER, Chief Engr., Southern California Water Co., said that in all of their oil lubricated bearing pumps, there was no trace of any pathogenic bacteria in the water supplies.

COMMITTEE ON WATER WORKS ADMINISTRATION

(The following report was made by Leon A. Smith, Supt. Water Dept., Madison, Wis.)

At an open session of the Committee on Water Works Administration, WENDELL R. LA DUE, Chief Engr. and Supt., Water and Sewerage Bureau, Akron, Ohio, acted as Chairman of the session. Mr. La Due is Chairman of the Committee. Co-chairman of the session was N. T. VEATCH, Cons. Engr. of Kansas City, Mo. Both men are past presidents of the A.W.W.A. Mr. La Due outlined the general objectives of the Committee on Water Works Administration and indicated that progress is being made by a number of the sub-committees.

The session was given over principally to the Preliminary Committee Report on **"Compensation of Water Works Personnel."** This report was presented by Leon A. Smith, Chairman of the sub-committee, and Supt., Water Dept., Madison, Wis. Mr. Smith called attention to the fact that there is a real need for a study of wages of water works personnel because men are leaving the industry for other fields for which they are less adequately trained, but where the wages are higher.

The work of the committee to date has dwelt on methods of procedure and the initial conclusions reached include these:

1. That no attempt to compare wages will result in any information of value, unless a comparison is made which is based on wages of employees doing comparable work.
2. That a classification survey would be the best initial step. This survey should include titles of positions, with fairly adequate statements of the work covered by each position, so that in making a comparison of wages, the committee would be certain that comparable positions were being considered.
3. That a portion of the $1500 appropriation made by the A.W.W.A. to this committee might be spent for such a survey.

Following a request for comments from the floor, which could be taken under consideration at the next meeting of the committee, approximately two dozen persons spoke. Included in these comments were the following:

CHAS. MOORE, Mgr. Water Dept., Roanoke, Va., emphasized the necessity of comparable classifications if a comparison of wages is to be made.

W. W. BRUSH, Editor, *Water Works Engineering*, New York City, expressed the opinion that this committee would be one of the most valuable to the association.

S. B. MORRIS, Gen. Mgr., Los Angeles Light and Water Dept., Los Angeles, Calif., stated that a general survey had been made in Los Angeles and that this information would be available to the committee.

M. B. CUNNINGHAM, Supt. Water Dept., Oklahoma City, Okla., believes that comparison with wages in other cities is not necessarily the answer.

M. P. HATCHER, Dir., Water Dept., Kansas City, Mo., said that comparison should not be made between water works utilities but between a local water utility and local industries.

MR. MONTGOMERY, a Water Works Commissioner from Denver, Colo., said his commission would appreciate any information the committee could give them to help in determining wages in Denver.

W. VICTOR WEIR, Pres., St. Louis Co. Water Co., St. Louis, Mo., does not believe that the salaries of water department employees should be tied up with the salaries of other municipal employees.

CHAS. ALFKE, Mgr., Hackensack Water Co., Hackensack, N.J., believes that the work of this committee should be of a continuing nature.

In Detroit, the City council fixes the rates for water works employees on the same basis as those of other city employees, according to H. F. SMITH, Sr. Adm. Asst., Dept. of Water, Detroit.

Reporting for the sub-committee on Municipal Water Works Organization, L. S. VANCE, Tech. Adv., Metropolitan Sewer Dist., Louisville, Ky., said that the work was being carried on as it had been in the past under former chairman La Due, and that the preparation, presentation, and publishing of papers on water works organization in several states and provinces not previously covered was now under way.

In the open discussion which followed, several persons spoke on the subject of wage scales. Such topics as the lag between committee work and wage scale changes, effect of civil service ratings on wage scales, and local conditions as they affect wages were among the items mentioned.

GENERAL SESSION

The general session on Wednesday included a panel discussion on the **"Ethics of the Water Works Industry."** (This session was reported by ARTHUR P. KURANZ, Supt., Water Dept. Waukesha, Wis.)

Water Works Ethics

"The water works industry should be above any party politics, inasmuch as it is serving the public," stated S. B. MORRIS, Gen. Mgr., Water, Light & Power Dept., Los Angeles, the first speaker on the Panel. Enlarging upon this statement, he stated that only businesslike conduct should be applied in the operation of the plant. Mr. Morris also mentioned that there should be no tie-up made with any labor group to the exclusion of any other, because of the nature of the service water works personnel and organizations render. In the matter of engaging professional services, he urged that no competitive bids be taken when making a selection of an engineer or any other professional person. The professional engineer is rendering a strictly professional service and, therefore, should not be classed as a commodity. In his closing remarks, he stressed that all in the water works industry should, by mutual association, exchange ideas and practices which would result in the most good for the most people.

Ethics and morality are one and the same thing, according to the statement made by R. F. ROCKWELL, chairman of the Board of Rockwell Mfg. Co. Mr. Rockwell stated that whoever conducted his affairs on a high ethical plane also conducted himself on a high moral plane, and that it is the duty of all in the water works field to raise this standard to its highest possible level. Mr. Rockwell also pointed out the fact that the water works manufacturing industry, as such, is not stagnant, and that new things are constantly being developed by the industry and for the industry and should receive its due consideration, thereby resulting in progress and better operation generally. The old bug-a-boo of offering consulting services by manufacturers was touched upon by Mr. Rockwell, but no clear-cut line of demarkation was brought out. Mr. Rockwell contended that the buyer could do much, in fact, perhaps more than most people realized, to keep manufacturers from lowering the standard of ethics and practices, by not permitting practices considered immoral or unethical in the matter of purchasing materials, supplies, and services.

The Golden Rule seemed to be the theme message of MALCOLM PIRNIE, Cons. Engr., New York City, who concluded the three-man Panel Discussion on this subject. In enlarging upon the Rule, Mr. Pirnie suggested that everyone concerned with the operation, management and development of a water works practice it, even stating that the regulatory bodies of the State must see that rates are fair in all respects and that fairness be applied to all plants alike. In the next age, according to Mr. Pirnie, the leadership will belong to those offering public service and there, again, he stressed the moral and ethical side of the industry and his discussion carried back again to the application of the Golden Rule. He felt that if this were carefully followed and practiced that surely our free enterprise system in America would far outweigh any other known system, adding that the profit system for business is right and necessary and that the system takes into consideration all people because the welfare of the people is the most important feature in our daily and regular contacts with them.

British Water Industry

The water works in England are in the midst of political discussion dealing with their nationalization, according to Mr. N. F. S. WINTER, President, International Water Works Assn., Halifax, Eng., but he did not venture an opinion as to the outcome. One very interesting observation was that the daily per capita use of water had risen about ten gallons since World War II, and it was his opinion that it was largely due to the fact that the returned servicemen had become accustomed to a somewhat different life in service than they had before the war and, consequently, felt the greater need for public services, such as water.

Mr. Winter also pointed out that the Water Resources Commission was adopted in England some three years ago and that an International Congress which will meet five years hence is being planned, to be held in Amsterdam. One significant point brought out by Mr. Winter was that the regulatory measures now in force in England are somewhat the same as one finds in some states in America, but that the rates of the various water utilities are reviewed regularly, sometimes as often as each year, but not more than every five years.

Wisconsin Policy on Funds

The water works in any community is not performing a Governmental function, according to Mr. Timothy Brown, member of the Public Service Commission of the State of Wisconsin, in his paper on **"Wisconsin Policies Concerning Water Department Funds."** While Mr. Brown pointed out that he was appointed to the Commission only a few months ago, his paper dealt with the statutes governing the management and operation of utilities. He pointed out that water works in Wisconsin were required to operate under a utility commission, composed of three, five, or seven members and that the earnings of such utilities were first used to meet operating expenses, maintenance, depreciation, taxes, interest and sinking fund requirements, additions and improvements, and any other necessary disbursements or indebtedness.

Income in excess of these requirements may be used to purchase and hold interest bearing bonds issued for the acquisition of the utility, or bonds issued by the United States or any municipal group of Wisconsin, or may be used to purchase a life insurance policy on the life of the Manager of the utility. Mr. Brown also mentioned that one of the requirements of the Public Service Commission was that all water utilities adopt a uniform system of accounting and reports, as outlined by the Commission. Mr. Brown confined himself largely to the statutes governing the operation of water utilities. Copies of these statutes are available on request to the Public Service Commission of Wisconsin at Madison, Wis.

(Ed. Note: The next issue will complete the report on the General Sessions and carry a complete report on the Water Purification Division sessions.)

W. Va. S. & I. W. A. Plans September Meeting

The West Virginia Sewage and Industrial Wastes Association is planning its Annual Meeting to be held at Oglebay Park, Wheeling, W. Va., on September 21-22, prior to the meeting of the West Virginia Section of A.W.W.A.

Sleeping accommodations will be available in the park cabins.

The West Virginia Section A.W.W.A. meeting starts on the afternoon of September 22nd.

CHEMICAL WEED KILLERS

And Some Experience in Weed Eradication Around Reservoirs

by
MARTIN E. FLENTJE,
Research Engineer
AMERICAN WATER WORKS CO., INC.
NEW YORK, N.Y.

Weed Growth on the Rip-Rapped Banks of the Commonwealth Water Co's. Reservoir, Summit, N. J.

WEED problems of the water works industry may be divided into three categories. The first is weed growths in the water itself, either (a) projecting above the water, or (b) growing entirely underneath the water surface. For these growths no solution is offered. Second, weeds growing on reservoir banks—either on banks sloping sharply toward the water or those on more level banks immediately adjacent to the water. Third, undesirable weeds and growths in other locations, as for example, on rights of way, driveways, walkways, parking lots, recreational areas, etc.

Any chemical used for control of the weeds falling into the first two divisions above must be of such character that no harm will be done to the water, through the use of the chemical, that would prevent its use for drinking and culinary purposes. If the area in question is on the immediate watershed of a public water supply, this same restriction will, of course, also apply to control of weeds in the third category. This restriction removes from consideration such effective chemical weed killers as the arsenical compounds, certain organic compounds (sulfamates), petroleum oils, and possibly certain chlorinated organic materials that are dangerous to use, or others which might cause taste and odor. This short report will deal with those weed killing agents that have come to our attention or have been used. Several have been experimented with and others appear to be useable in public water supply locations.

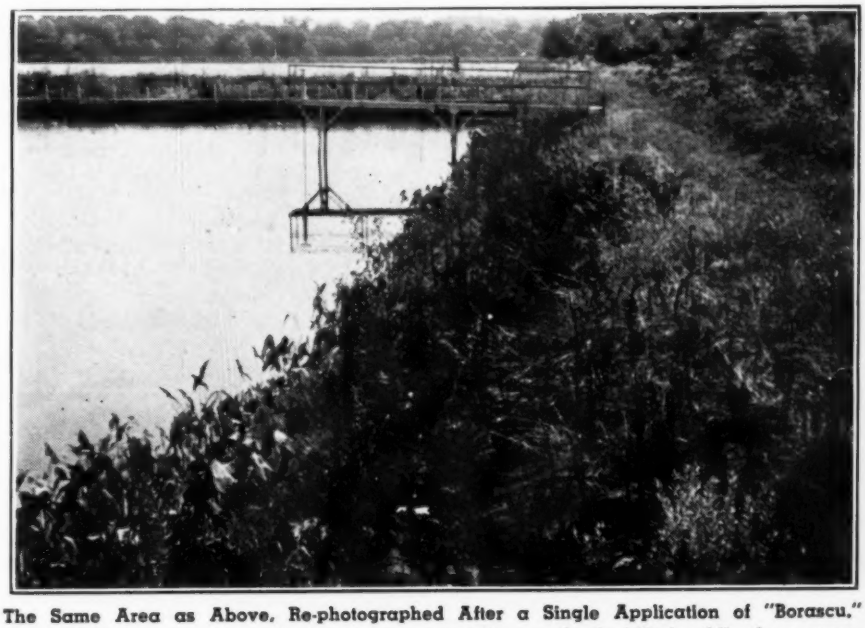
Chemicals With Greatest Promise

The chemicals that offer promise (with safety) appear to be:

2,4-D Compounds

The 2,4-D compounds (now widely used on lawns and on farms). Chemical weed killers are classed as either (1) selective, or (2) non-selective. The 2,4-D chemicals under usual dosages are selective "agents," which means that they will kill certain weeds and plants and not others (a "non-selective" agent will kill all plant growth). The various "2,4-D" weed killing compounds are formulations of 2,4-Dichlorophenoxyacetic acid. Among the compounds available are the sodium salt of 2,4-D acid; a compound known as "2,4-D,amine" and containing triethanolamine salt of 2,4-D acid; and an ester form of the acid called "2,4-D,Ester", "Esteron", etc.

The 2,4-D weed killers are particularly effective against broad-leafed plants, killing off the top growth and in the case of certain weeds killing off a high percentage of the roots also.



The Same Area as Above, Re-photographed After a Single Application of "Borascu." *(Note that the growths on the banks are essentially completely killed, while those growing in the water were not. For details see text.)*

The 2,4-D weed killers are non-poisonous to humans and animals. They are neither combustible nor inflammable and will not corrode equipment. They only temporarily affect soil—the time varies from approximately 2 weeks to 4 months depending on condition of soil, rainfall, etc.

Near Washington, D. C., and in Louisiana 2,4-D chemicals have been successfully used to control weeds growing in water (not, however, used for water supply). Three applications were required. An experiment with the ester form of 2,4-D is being carried out by the writer's organization this summer at Bristol, R. I. The weeds in this location are largely the broad-leafed type known as "Ponderose".

Chlorates

It is claimed that there are no other chemicals as effective for weed control as the chlorates. Chlorates are "non-selective" and kill all kinds of weeds and grasses. They are quick acting and, according to manufacturers, destroy both roots and vegetation. Sodium chlorate, the most used of the chlorates, is safe for use in a water supply. Users must, however, take *extreme caution* in handling and applying it due to the fire hazard involved. One product contains calcium chloride which greatly minimizes the danger of fire when sodium chlorate is used. Sodium chlorate is also sometimes mixed with borax to get long-term weed control.

Borax Compounds and "Borascu"

One of the so-called minor elements necessary for plant growth is boron. Large quantities of boron, however, result in the death of most plants. This fact is made use of in killing weeds with boron compounds. One such product is known as "Borascu". This material is described by the Pacific Coast Borax Co. as a concentrated borate ore, from which borax in the refined form is obtained. "Borascu" is easily applied, is non-combustible, non-corrosive and safe to handle, but can only be used where it is desired to free an area of *all* vegetation. Poison ivy seems especially susceptible to "Borascu". Under favorable conditions, "Borascu" functions as a soil sterilant and when a sufficient quantity has been applied (either originally or in a retreatment) the average weed growth will be under control until the normal leaching has taken the boron content below the effective layer of top soil in which the roots are growing.

Good results have been obtained with this chemical on a stone-faced (rip-rapped) sloping reservoir bank at Summit, New Jersey, following experimental application in 1948, in which 90% control was achieved with but one application—(see pictures).

The rate of application of 15 pounds per 100 square feet of area was somewhat higher than proposed by the producers, but was employed because of the advanced stage of growth and the sloping creviced surfaced to be treated. The usual application advocated is 10 lbs. per 100 sq. ft., and as little as one half this rate is said to be sufficient to kill poison ivy.

Chemical weed killers can be applied at almost any time, but are generally most effective on young plants. The materials mentioned above are relatively inexpensive and seem to warrant further consideration and test in water-supply areas.

FORD METER BOX EMPLOYEES ATTEND AWWA CONVENTION

Something New in Public Relations

A new idea in public and employee relations was instituted at the A.W.W.A. Convention early in June.

In order that the employees of the Ford Meter Box Co., of Wabash, Ind., might attend the A.W.W.A. Convention, the company plant was closed down completely on Wednesday of that week. The employees drove in their own cars to Warsaw, Ind., entered a special car on a Pennsylvania train and came into Chicago for the day.

According to the Ford Brothers, Wilbur, Richard and John, "everyone seemed to have a good time." The management was well pleased with the reaction of the employees to this idea. They believe that the employees now have a better appreciation of the service of their company to the water works industry, and, also, of the wide extent their product is used by the water works industry.

This experiment in employee and public relations apparently paid off. So far as we know, it is a unique situation when a company closes down its business and transports its entire employed staff to a water works convention. In the accompanying photograph appear 61 of the 70 employees as they gathered at the booth of the Ford Meter Box Co. in the Exhibit Hall at Chicago.

West Virginia Issues Warning On "Bargain" Carbon

The Div. of Sanitary Engineering of the State Department of Health of West Virginia, Charleston, W. Va., has issued a notice to public water supplies in that state, concerning "bargain" carbon. The notice reads as follows:

"The State Health Department has received a warning from the Federal Food and Drug Administration regarding a chemically treated activated carbon originally prepared for gas mask use, but which has been sold to various purchasers by the War Assets Administration. Some 10,000,000 pounds of this material has been sold throughout the United States. Use of this material in water treatment may be *dangerous* and you are advised to avoid making any purchases of "bargain" carbon, or using any such carbon which may have been purchased.

"The material was sold by the War Assets Administration as "WHETLERITE" Charcoal; however, the original purchasers have resold it and the original identity may have been lost."

This notice was issued to the water supplies in West Virginia under the signature of H. K. Gidley, Acting Director.

OPERATION OF SMALL WATER PLANTS

Meters and Metering

by

A. E. CLARK

General Manager

NASHVILLE SUBURBAN UTILITY DISTRICT

NASHVILLE, TENNESSEE

THERE are those who think that water, like the air we breathe, should be free or should be furnished for a very nominal charge. Water is an essential commodity, and like gas or electricity, it costs money to process and distribute to the consumers. Whether it is furnished by a private company or a municipality, it is necessary to realize sufficient return to produce a profit or, in the case of a municipality, enough to provide the services demanded by the consumers.

The fair way to charge for water is for the consumer to pay for the quantity of water he uses. If he chooses to waste water or allow leaking fixtures to run without being repaired for long periods of time, he should pay for it. The consumer who uses normal quantities of water and repairs leaks as they occur should in in turn only pay for what he actually uses. It is surprising to know the number of consumers still being furnished water on a flat rate basis. As long as this condition obtains there will not be any incentive to curtail wastage of water.

Water Wastage

Water wastage works a hardship two ways. It not only places a burden on the water department by making it necessary to continually provide increasing quantities of water, but overloads sewers and the sewage disposal plant if one is used, thereby causing an increase in capacity to be provided. The use of the flat rate is inequitable because sufficient revenue must be raised either by means of increased water rates or by taxes. In either case, the careful user of water is penalized. The equitable and fair method of paying for water is according to metered use. Every service should be metered and every consumer should pay for the water used through his service. A metered consumer has no basis for complaint from the standpoint of each user paying for what he uses, regardless of the use. Costly experience in the past by many municipalities has led practically all new water systems to provide for 100 percent metering.

The Author

Types of Meters

Meters for the use of residence services are either the disc or piston type. For larger services the compound meter or flow type is used, depending on the maximum or minimum flow. For measuring large flows, the venturi tube, orifice plate, or flow type is used where the minimum flow falls within the range of each. Selection of the type and size of meter for any particular service depends on collecting information on the water usage.

Each meter, whether a 5/8 in. or larger size, is rated to furnish a certain number of gallons per minute. If a meter too small for the service is installed either of two things happen; (1) the consumer fails to get a sufficient quantity of water, or (2) the meter under certain conditions of pressure and volume may be able to furnish the quantity used but is unable to stand up under the service requirements and finally breaks down.

Over-metering also has its faults in that the proper quantity required is furnished but during low flows the meter may fail to register and thus provide service for which the water department receives no revenue. If there is a question regarding the type and size of meter to be used for any particular service consult one of the meter manufacturers and they will furnish complete information.

Meter Changing

A meter, like any other piece of mechanical equipment is subject to wear and failure. Some water departments install water meters and believe that from then on their troubles are over, but such is not the case. After a meter is installed, an accurate record should be kept of its service. Obviously, the meters to be used should be those which give the longest service with accurate registration and the lowest maintenance cost. Various studies have been made to determine the average total registration for changing meters. The type of water measured has a bearing on this factor and can only be determined by careful checking in each system. Regardless of the time interval, if the water department is to receive payment for practically all water furnished the consumers, a schedule of meter changing must be set up. In one city, this may be every five years, in another ten. All water departments which have set up such schedules have found that it pays, because a relatively small number of meters are registering low at any particular time.

Meter Repair

Does it pay a small water department to maintain and repair its meters? This depends on a number of factors but in general it is believed that it does pay the small water department to do this. The cost of installing meter testing equipment and the necessary spare parts in tools are not too expensive. The number of spare parts depends on the number of meters in service and the different types and styles of meters. Meters like any other equipment should be purchased according to specifications, and not too many different makes of meters should be installed because it means carrying spare parts for each make purchased. If meter repair work is to be done, the man who does it should be properly trained in repairing each make of meter used.

A number of spare meters should be kept in stock, either new or repaired, to replace the dead and slow meters as they are taken out. The amount of repair work that should be done on a meter is open to argument, but in general if the cost of repairs exceeds half the cost of a new meter, consideration should be given to replacement with a new meter. Besides the dead and slow meters removed, a schedule for the changing of meters after being in service a predetermined

period of time should also be set up and this means changing some of the meters even though apparently operating satisfactorily. There is also the necessity of removing a number of meters for test based on consumer complaints of high bills.

If, for any reason a meter is replaced, it is considered good practice to take the meter apart, clean it thoroughly and replace any worn or defective parts at that time. To do so is better than to take the chance that the meter is in good condition and replace it in service with the possibility of its going dead within a month or two. It is also good practice to test all meters taken out of service before repair except, of course, the dead ones.

Meter Records

Many times it is easier to test a meter in the field. Test meters can be purchased or a new stock meter can be used making up the necessary connections for field work. Whether a test meter is purchased or one is used from stock, it should be tested frequently to be sure that it registers correctly.

A careful record should be kept of all meter repairs costs as well as the number and reason for changing. It is desirable to give a number to each new meter installed, that is, each new connection. Metallic tags are usually best for this purpose and may be attached to the meter either with copper wire or under one of the bottom bolt heads. When this meter is replaced the tag is removed and attached to the meter installed in its place. This number remains at this connection regardless of how many times the meter is changed.

A meter repair card should be attached to each meter as it is returned to the shop showing location, tag number, meter size, make and serial numbers, reading as received and after repairs, the location from which it is taken, space for results of test on arrival and test after repairs, remarks, etc., name, location and tag numbers of new location with space at the bottom showing date received, date reset, date tested. On the back of the card the repair record is kept. These cards should be printed on good "tag stock" because they sometimes receive pretty rough treatment. Provision for storing meters should be made at the shop by means of meter racks so that both new and repaired meters can be stored upside down and away from any intensive heat.

Type of Register

Meters register in either gallons or cubic feet and the registers are either straight reading or round reading. Local practice governs which will be used, gallons or cubic feet. Concerning the type of register, that is a matter of opinion. The straight reading registers can be read faster and the writer believes with less chance of error than the round readers; however, when it comes to maintenance costs the round reader is cheaper.

After a policy has been established as to the unit of measurement of the water and type of register it is well to adhere to it. Some water departments make a practice of sealing the register boxes on all meters. This will prevent tampering with the registers.

Service Materials

New meter connections are installed by the water department and in some cities by plumbers. Regardless of who makes the installation the water department must adopt standards of material and equipment. A standard policy should be adopted setting out the material between the meter and main, such as galvanized pipe and lead goose neck, lead pipe or copper tubing; location of tap whether on top of the main, side or at approximately 45°; type of curb stop, meter box, meter connections whether yoke or straight through the box, type and make of meter which meets the specification; meter box and cover, if outside installation.

If the water is non-corrosive the life of galvanized pipe is considerably longer than when used with a corrosive water; the life of lead pipe is undeterminate although where wiped joints are used some trouble is experienced with these at times and this is controlled to some extent by the pressure to which the line is subjected. The writer has adopted the policy of using copper tubing, and during the past two years in the installation of approximately 1500 new connections has found it to be entirely satisfactory and quickly installed, whether laid in trench or where a pipe has been jacked under the paving.

Instead of using a hand-operated pipe jack, 1 in. galvanized pipe can be driven under the pavement with an air compressor, utilizing the tamping tool in place of the bull point in the air hammer. A coupling fitted with a plug is used on the front end of the pipe. Little difficulty is experienced in withdrawing the 1 in. galvanized pipe and following it with the ¾ in. copper tubing for a standard meter connection.

Outside Installations

In outside installations the meter box is usually placed just outside the property line. This of course gives access to the meter at all times. Meter boxes can be either clay tile, concrete, brick, or metal and the tops either the lock type or metal cover and frame cemented to the tile, concrete, or brick.

Whatever type of meter box is used, consideration should be given to changing meters. A meter box of a type and size which makes it possible to change meters with the least effort is preferable. Room should be allowed for replacing broken meter connections or tightening up leaking connections which are bound to occur.

After a new meter installation is completed the tap card should be completed with a sketch on the back of the card showing the location of the connection with definite measurements so that it can be easily located. The tap card should also show the location of the meter installation in relation to the tag number of the connections on each side so that the new meter sheet can be properly placed in the meter reading book.

Summary

Meters are a most important part of the system because on them depend the revenue obtained. The tests to be met by a meter are pretty well standardized and it should be the policy to know that all meters installed meet the test and every effort should be made to keep the operating meters in such condition that all water used is measured within the limits of accuracy of the meters. Slow or dead meters will decrease the revenue and the present economic situation makes it mandatory that all consumers pay for the quantity of water used.

Corrosion Short Course

The National Association of Corrosion Engineers is sponsoring a "Short Course on Corrosion," scheduled for September 12-16 at the University of Texas in Austin, Texas.

The plan of the course has been outlined to include nine 2-hour lectures, followed by discussion periods. Two lectures will be devoted to background and consideration of pertinent aspects of thermo-dynamics, kinetics and electro-chemistry. The remainder of the lectures will be devoted to detailed consideration of corrosive process and corrosion prevention. Efficient prevention practices will be discussed.

Housing for 170 on the University Campus has been made available. Registration fee for the course is $20.00. Applications for official registration blanks may be had from A. E. Campbell, Executive Secretary, National Association of Corrosion Engineers, 905 Southern Standard Bldg., Houston 2, Texas.

INDIANA SECT. 41ST ANNUAL MEETING

FORTY-ONE years ago a group of water supply and public health men met and formed the Indiana Sanitary & Water Supply Association. In 1925 this association

Chairmen

Incoming
M. P. Crabill
Supt. Purif.
Ind'p'lis Water Co.

Outgoing
Clyde Williams
Cons. Engr.
South Bend, Ind.

became the Indiana Section of the A.W.W.A., which now has a membership of 206 and a great desire to increase it. From the interest shown in the meeting held in Indianapolis on April 20-22, it appears that a further growth in membership is assured. Attendance at this meeting broke all previous records, there being 266 present.

Business Session

Officers elected to serve for the ensuing year are the following:

Chairman
Marshall P. Crabill
Supt. of Filtration
Indianapolis Water Co.

Vice Chairman
Jack Gordon
Supt. of Water
Rochester, Ind.

Secretary
Chas. H. Bechert
Dir., Div. of Water Resources
Ind. Dept. of Conservation
Indianapolis, Ind.

Asst. Secretary
George Fassnacht
Chief, Water Supply Sect.,
Ind. State Bd. of Health
Indianapolis, Ind.

A.W.W.A. Director
E. F. Kinney
Dist. Mgr., Wallace & Tiernan
Indianapolis, Ind.

Fuller Award

At the final luncheon, where all business matters are transacted, the Fuller Award Committee made the following report:

"We have chosen a man who has given more than 20 years of continuous service to the water supply field. During this period he has served on both sectional and national committees. He has assisted in the development of many nationally accepted standards and procedures. He has also contributed much to the development of many men in our association. We have chosen for the Fuller Award LEWIS S. FINCH in recognition of his persistent and faithful devotion in applying and teaching sound and ethical practices in the water works field.

Flocculation

The first technical session was called to order by CLYDE WILLIAMS, Chairman and Cons. Engr., South Bend, Ind. Mr. Williams turned the chair over to M. P. Crabill, Supt. of Purification of the Indianapolis Water Co., who presented the two speakers, and who, incidentally, reported the two following papers.

In the absence of S. L. Tolman, Sales Mgr., Sanitary Engineering Div., Jeffry Mfg. Co., Columbus,

Fuller Award
L. S. Finch
Chief Engr.
Indianapolis
Water Co.

Ohio, the paper on **"Flocculation"** was presented by Clarence T. Kaiser, Sanitary Engineer, Jeffry Mfg. Co. Mr. Kaiser stated that the prime requisite of good floc formation is a thorough and uniformly dosed water before it goes to the flocculation basin. Laboratory tests show that for any given condition there is only one correct chemical dosage. After initial mixing the flocculation must incorporate all the turbidity into the floc particle to give the best settling characteristics.

The best method of arriving at the correct solution of flocculation problems is by the use of a true scale model. All factors of disturbance to hydraulic conditions in the prototype must be included in the model. The detention time in the model should be the detention time of the prototype divided by the square root of the scale ratio. Model scales with a ratio of 30 to 1 may be used with confidence.

The models demonstrate how the flow will pass through the structure and the minimum size of the structure necessary. The hydraulic conditions of the basin are expressed in terms of the dispersion index which is defined as the ratio of the time ninety per cent of the flow has passed out of the basin to the time the first ten per cent has passed through. A perfect dispersion index would be 1, but good results may be obtained with an index of 2.5 or less. For conducting a dispersion test, salt may be used on a plant scale and dyes may be used on a model scale.

By use of slides, Mr. Kaiser showed the time required for a dye solution to enter the flocculator and pass through all of the bays, finally making its exit to clear the whole structure. He also pointed out the eddy currents which facilitate good floc formation and the relation of these currents to the size and spacing of the paddles.

Public Relations

John E. Kleinhenz, publicity director of the Indianapolis Water Co., presented a motion picture in color, entitled **"At Your Service—Willing Water."**

The film showed the operation of the Fall Creek Division of the Indianapolis water supply, and illustrated many uses of water. Kleinhenz himself did the photography and editing. Music and titles were added at a Chicago Laboratory. Narration accompanying the film was made by microphone, thus allowing frequent "ad lib" remarks and other references to keep the story up to date.

Main Disinfection

B. A. Poole, Director, Div. of San. Engr., Indiana State Bd. of Health, discussed **"Main Disinfection"**, and

Vice Chairman
Jack Gordon
Supt. of Water
Rochester,
Ind.

A.W.W.A. Director
E. F. Kinney
Dist. Mgr.
W & T
Indianapolis

Sec'y-Treas.
C. H. Bechert
Director
Div. of Water
State Consr. Dept.
Indianapolis

Asst. Sec'y
G. G. Fassnacht
Chief
Water Sup. Sect.
State Bd. H'lth
Indianapolis

reviewed and highlighted the important sections of the A.W.W.A. committee report on that subject. Mr. Poole, who is chairman of that committee, also discussed some of the compromises.

In the matter of packing, the committee report omitted jute and listed the other packings in the order of desirability as follows: (1) molded or tubular rubber rings, (2) asbestos rope, (3) treated paper rope, (4) braided cotton, and (5) hemp. The committee report stated that of these, hemp was the least desirable "and if used, shall be treated with a bactericidal agent which will as effectively as possible retard or prevent rotting and related undesirable bacterial growth."

The committee report contains some very definite notes on procedures for the disinfection of hemp or other vegetable-derivative packing material. The recommended agent is an organic mercurial known under the trade name of "Klerol". It is not on the market at the present time. Another compound which has been successfully used in at least two instances is a quaternary ammonium compound known as Polymine D. It has also been reported that Milwaukee uses a quaternary ammonium compound known as Katon. Mathieson Chemical Corp. is now studying a similar compound known as Q.A.S. but it is not ready for the market, as yet.

Mr. Poole believes that there are a number of compounds on the market which may be suitable for disinfecting hemp, but they should be tried out on a water supply before being adopted by that supply, because they vary in effectiveness in different waters.

The use of lime for this purpose has also been tried and looks promising for reasonable results. The states of Michigan and Minnesota do not approve hemp or braided cotton, and the committee feels that perhaps both of these items should be deleted from the approved procedure.

The Hemp, Jute Packing and Oakum Inst. has stated that it will have a disinfectant by 1950, but Mr. Poole is not optimistic.

Among the other points which Mr. Poole discussed was the matter of preliminary flushing of mains. The specifications call for a velocity of at least 2.5 fps. at the end of the main. Mr. Poole said that even this was not a scouring velocity and that to obtain it in a 12-in. main would require 980 gpm. through a 2½ in. opening. On a 20-in. main it would require three 2½-in. openings or one 4½-in. opening.

On the matter of chlorination of pipe lines, the procedure recommends a period of at least 24 hours with a residual at the end of that time of 25 ppm.

Dinner Speakers

H. E. Jordan
Exec. Secy.
A.W.W.A.
New York City

J. L. Quinn, Jr.
Div. of Safety
Indianapolis
Motor Speedway

Planning
M. P. Hatcher
Director
Water Dept.
Kansas City, Mo.

Pub. Relations
J. E. Kleinhenz
Pub. Director
Ind'p'lis Water Co.
Indianapolis

In answer to a question as to the relative cost of rubber packing, HARRY JORDAN, Secy. of A.W.W.A., stated that rubber and braided paper are being sold competitively in the water supply field today and therefore the cost cannot be too high. Mr. Jordan stated that the problem of residual contamination of water in mains by the use of hemp or jute can be eliminated by not using the material. He thinks that the water works industry as a whole has taken the problem of pipe laying too casually for too long a time.

Frank Amsbary of Champaign-Urbana, Ill., uses an an-ionic wetting agent with chlorine for main disinfection with good results.

Air Conditioning

Speaking not as a committee chairman, but as an individual, Frank C. Amsbary, Manager, Illinois Water Service Corp., Urbana, Ill., discussed the subject of **"Air Conditioning"**. In his opinion, there will be an increase in the demand for air conditioning and an increase in installations as materials become more and more available. This being true, it will be better to control air conditioning now before a utility runs into trouble later.

Mr. Amsbary doesn't believe in preventing air conditioning but he does believe that the units installed should provide for conservation of water. Among other things, he recommends restrictions now on water

Quiz Show Contestants

Harvey Kulin
Indianapolis

L. F. Couch
Indianapolis

Max Barrett
Ft. Wayne

J. B. Wilson
Indianapolis

John Ford
Wabash

L. A. Geupel
Evansville

B. A. Poole
Director
San. Engr. Div.
St. Bd. H'lth
Indianapolis

F. C. Amsbary
Manager
Ill. Water Serv.
Urbana, Ill.

Programmers

D. P. Morse
Engineer
Indianapolis
Water Co.

F. R. Witherspoon
W. W. Engineer
Ind. P.S.C.
Indianapolis

H. J. Draves
Supt.
Water Dept.
Michigan City, Ind.

Ev. Robbins
Engr.
Water Dept.
Speedway, Ind.

for air conditioning where wells are the source of supply. For surface supplies, the matter is one of economics.

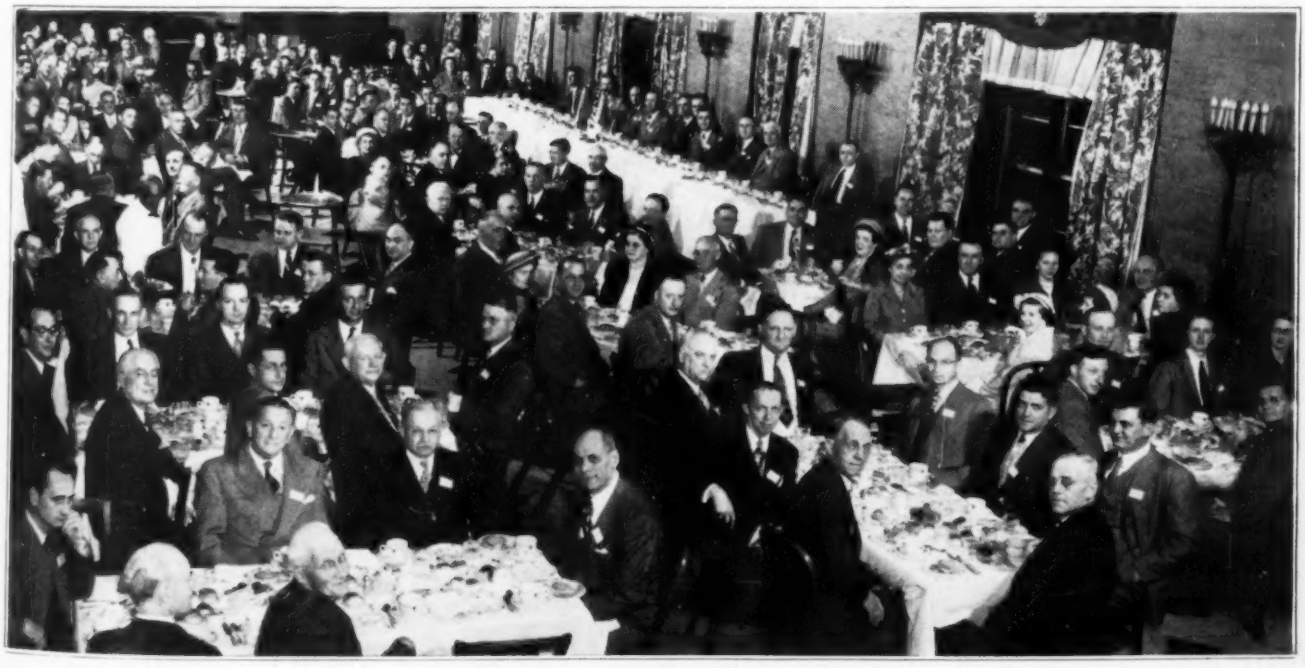
At Urbana-Champaign their rules prohibit the direct use of water for cooling purposes; they prohibit the compressor type for less than 1½ tons of refrigeration; they allow capacities of 1½ to 5 tons for emergency use without water conservation equipment; and all units over 5 tons capacity must provide water conservation, i.e., must not use water except for makeup purposes. It is noted that a five-ton unit will use 10 to 15 gpm. or 150 times the normal household use.

This subject was discussed first by GEORGE G. FASSNACHT, Chief, Water Supply Sect., Div. of San. Engr., State Bd. of Health, Indianapolis. Mr. Fassnacht said that there are no public water supplies in Indiana which now regulate air conditioning, but the state law limits the use of ground water to 200 gpm. Before water utilities limit the use of water for this purpose because of the wastage, Mr. Fassnacht believes that they should first meter the entire consuming public and stop all leaks. After all, a water supply is in business to sell water. He quoted Elwood Bean of Philadelphia who had said that if a water supply is using 90 per cent of its capacity in summer or 70 per cent of its capacity on a yearly average, it will be in trouble when air conditioning began to be installed.

T. R. DAVIS, Engineer, Ammerman, Davis and Stout, Indianapolis, is of the opinion that there is a bit of hysteria on the part of water works operators in reference to air conditioning. If the supply is short, then there is a problem, but air conditioning can no longer be considered a luxury, and its use will continue to grow. Mr. Davis also pointed out that it is not alone the water works operator who should be thinking about air conditioning, but also the sewage treatment department because the flow of water is or may be more important to sewer sizes and sewage treatment than to water departments.

D. P. MORSE, Engineer, Indianapolis Water Co., has made some surveys in Indianapolis and finds that air conditioning demands on normal lines has reduced the available water for other consumers. As a result of a good public relations approach to the problem, the manufacturers of the equipment now ask the plumbers to check with the water company before an installation is made. At the present time, the company supplies 15 per cent of the water used for air conditioning in Indianapolis; private wells supply the balance.

It has been noticed that there is a definite trend upward in ground water temperature at Indianapolis, particularly in the downtown area where much of this water is returned to the ground. The temperature is now 65 deg. F. and reaches 70 in the summer months. With this increase continuing it may be expected that more



Forty-First Annual Banquet Ind. Sect. A.W.W.A.

water will be taken from the Indianapolis Water Co. in the future for this purpose, but there are no restrictions on the use of water for air conditioning at the present time.

G. V. SAVAGE, Ch. Engr., Bevington, Taggart & Fowler, Cons. Engrs., Indianapolis, Ind., emphasized the point that only water and air are cheap enough to carry heat away in a fluid. Air cooling requires too much power up to one horsepower, but is O.K. for local installations.

Large air conditioning units of 25 tons or more all use conservation devices, but the smaller ones generally do not. It is the smaller users in the aggregate which will use a lot of water, and this must be kept sight of in studying the problem, for there is a definite trend toward the installation of air conditioners.

the free limit of the utilities responsibility, and income from water sold will pay off the cost of the main in 6 years, then it must be installed. Outside of the "free limit", the utility may require that the consumer make a deposit. Present consumers should not pay for future possible water users. Any main installed should provide income to offset the charge or cost of the main. Hydrant rentals should be made on the basis of the inch-foot system of charge.

This topic was discussed by a panel under the leadership of LEWIS S. FINCH, Chief Engineer, Indianapolis Water Co. Mr. Finch briefly reviewed this subject of water main extensions as it was discussed at the A.W.W.A. San Francisco meeting in 1947.

Appearing first on the Panel Discussion was H. J. DRAVES, Supt. of

stallations, enlarging mains or making replacements, and jurisdiction the Pub. Serv. Comm. In India the P.S.C. rules apply to both municipal and private supplies alike.

Future Planning

"Planning for the Future" was the topic introduced by Melvin P. Hatcher, Director, Water Dept., Kansas City, Mo. Mr. Hatcher said that there are now many plants designed on the drawing board but not constructed. Most of these were the result of the "Blue Print Now" program and of the Federal grants for planning through the Bureau of Community Facilities of F.W.A. Most of these plants should be built for the future needs of the various communities and many of them should be built for present needs.

In planning for the future, pop-

Quiz Show Contestants

E. H. Crum, Alton, Ill. — *Don Jenkins, Michigan City, Ind.* — *Jack Gordon, Michigan City, Ind.* — *L. J. Killian, Evansville, Ind.* — *J. E. Kleinhenz, Indianapolis* — *T. E. Driskell, Columbus, O.*

The A.W.W.A. Office

Following the luncheon of the second day, HARRY E. JORDAN, Executive Secretary of the American Water Works Assn., spoke on the work of the A.W.W.A. office. In describing the different jobs of the personnel in his office in New York City, Mr. Jordan made it apparent that the members of the association receive a goodly return in services rendered for their ten dollar dues. Mr. Jordan did not say as much but it was obvious to his listeners that when one added up all of the services which his office performs, the ten dollars dues is a mighty good investment each year for any water works man.

Water Main Extensions

The Senior Water Works Engineer of the Indiana Public Service Commission, F. R. Witherspoon, spoke on the subject of **"Water Main Extensions,"** pointing out that most of the complaints to the Pub. Serv. Comm. are from potential customers who think that a water utility is obligated to furnish them water, when this is not the case.

In Indiana, if the main is within

Water, Michigan City, Ind. Mr. Draves said that he followed the ideas of the Public Service Commission. Extensions would be made if the revenue will pay it off in six years. If not, the consumers will have to pay the difference between the "free extension credit" and the cost of the main.

JACK GORDON, Supt. of Water, Rochester, Ind., pointed out that even the small communities needed a plan and a policy. There are often too many real estate developments that don't develop. Mr. Gordon believes that it is up to the city to work with the subdividers and promoters to help to bring business to a city but the arrangements must be fair.

EVERITT ROBBINS, Water Works Engineer, Speedway City, Ind., likewise believes that the small community must have a definite plan and he cited an example to prove his point.

This topic drew a considerable discussion from the floor on such phases as size of pipe, inch-foot charges for hydrant service, subsidizing of industry, adding on to previous in-

ulation trend is not the only criterion. Such variables as the impact of air conditioning, industry, and personal needs must also go into the basis of consideration.

Mr. Hatcher believes that all properties should do some planning and that procedures for planning will vary. Small communities need help of consultants, who, of course, desire good records of operation. Distribution studies often receive the least attention, a fact that is to be deplored. In Kansas City, a Hardy Cross study of the system showed where a new main was needed. This was planning at its best.

Recording pressure studies likewise are helpful and rate studies are imperative if future planning is to be done properly. Planning for supplies is likewise important.

In discussing this topic, J. B. WILSON, Cons. Engr., Indianapolis, Ind., emphasized the fact that there are now too many antequated systems, too many poor supplies, too many towns where water must be rationed. All of these need plans for future or immediate improvement. It is the duty of the superintendent to keep the

council informed of the needs of the water supply utility, and consulting engineers should not fail to push to fruition a plan when it is obvious

Programmers

H. B. Steeg
Cons. Engr.
Indianapolis

D. P. Backmeyer
Superintendent
Marion, Ind.

that it is sorely needed. Funds should be found to construct needed improvements. These were the sentiments expressed by Mr. Wilson.

PAUL FRAME, Pres. of Ulrich Chemical Co., Indianapolis, Ind., spoke of the necessity for water works officials to adopt future planning in regard to supplies as well as equipment and repairs. If utilities will make their plans for at least a year in advance, it is possible for supplies to be furnished at lower cost than if they have to be supplied on emergency basis. Arrangements can be made to have supplies shipped on regular dates. Over- or undershipments can be adjusted as necessary.

Rate Increases

The subject of **"Rate Increases"** was introduced by Thos. Burrin, Mgr., Lebanon Utilities, Lebanon, Ind. Mr. Burrin's comments referred mostly to his experience in obtaining a rate increase through the Indiana Public Service Commission. It is essential that the utility obtain an attorney to draw up a petition which must contain certain definite information.

Mr. Burrin is a firm believer in good public relations in the form of plenty of publicity before application for a rate increase is made. On making a consumer study he found that certain blocks of users were using more water than they were proportionally paying for. This information was included in the petition, and was helpful in the cause of a rate increase.

Mr. Burrin emphasized the fact that water should not be sold for less than cost. Such costs should be figured to include all types of fixed and operating costs.

D. P. BACKMEYER, Supt., City Water Works, Marion, Ind., raised the question, "Are you getting all of the revenue from present rates?" To show how important this factor is, Mr. Backmeyer cited the example of multiple housing units in Marion, where a three-unit house pays the same minimum usage charge per quarter as a single house. With permission of the P.S.C., the Marion City Water Dept. will hereafter make a charge of three times the minimum usage. This will bring in an added income of $1.20 for each of 1000 housing units. The department will assign two men to explain this change personally to each of the units concerned.

HENRY B. STEEG, Cons. Engr., Indianapolis, Ind., in discussing this subject stated that there are many plants operating on rate schedules which were set up fifty years ago. Mr. Steeg said that these rates were either too high when set or were far too low now. Most plants now need both physical and financial improvements. In some cases complete revision of existing plants is the answer to higher rates. He cited an example of an old steam plant for which pumping costs were 9 cents per 1000 gal. Complete electrification of the plant at a cost of $25,000 reduced pumping costs by $8000 a year. In three years this installation will be paid for and the utility will have its increased financial return. "Making dollars go farther is as good as a rate increase." According to Mr. Steeg, only 100 or so of the 350 to 375 plants in Indiana have gone before the P.S.C. to ask rate increases. Many have no hydrant charges, and some are actually giving away water free. Mr. Steeg says that all of these water utilities which have not done so should consider the need for increased revenue and ways to obtain it.

In the discussion which followed, PROF. R. B. WILEY, Head of Civil Engineering at Purdue, pointed out that sometimes when utilities wanted to up their rates on certain brackets of users they drive their big users out of town, as was the case at West Lafayette, Ind. This raised the question as to whether or not a utility should sell water for less than cost.

Programmers

*Paul Frame**
President
Ulrich Chem. Co.
Indianapolis

W. G. Keck
Geologist
Layne-Northern
Mishawaka, Ind.

**Mr. Frame died suddenly on May 15 of a heart attack.*

Programmers

Thos. Burrin
Manager
Lebanon, Ind.

J. B. Wilson
Cons. Engr.
Indianapolis

Several persons pointed out that it costs less to pump water for large users, and full recognition of this fact should be given when setting up rate schedules.

Electric Logging

W. G. KECK, Geologist, Layne Northern Co., Mishawaka, Ind., told of the **"Preliminary Studies on a Method for Determining Aquifer Permeability by Electric Logging."** This method is an adaptation of geological studies of oil formation. Layne-Northern Co. uses it in rotary drilling for water.

The equipment is simple, utilizing two electrodes, but the building of the equipment is important. The principle of operation is to lower the electrode into the well hole containing the drilling mud and to plot the resistivity. While it is hard to distinguish clean fine sand from gravel, it is possible to distinguish clay and rock from gravel formations. Generally speaking, the higher the resistance the more certain that water is in the stratum.

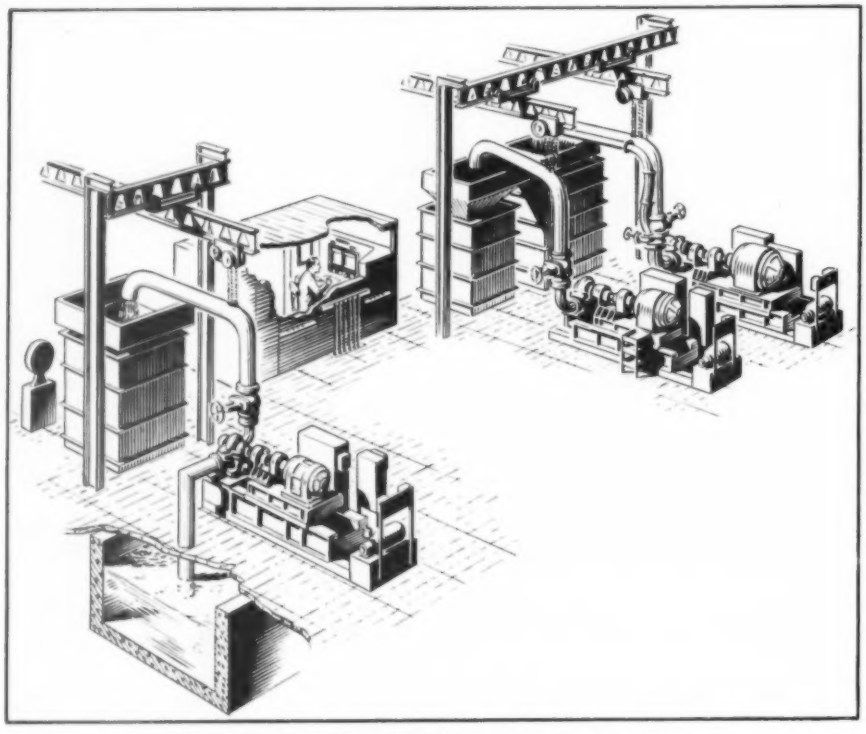
Mr. Keck showed graphs of actual well formations and the resistivity results obtained which indicate that this is an able and cheap tool for exploration for water supplies.

Entertainment

At the annual banquet, JOE QUINN, Director of Safety, Indianapolis Motor Speedway, entertained the diners with the story of "The Great Hoosier Spectacle—500 Mile Race." Also appearing at the banquet was the Purdue Mixed Choral Group under the direction of Albert Stewart.

The Wednesday evening session consisted of a Buffet and Smoker. Feature of the session was a Quiz Show, with prizes of varying value up to a portable radio. Acting as M.C. and Quiz Master was George E. (Doc) Symons, Assoc. Ed., *Water & Sewage Works*, New York City.

ALLIS-CHALMERS CO. INSTALLS NEW PUMP TEST FLOOR



Artist's Sketch of New Allis-Chalmers Pump Test Floor

ON July 1st, the Allis-Chalmers Mfg. Co., of Milwaukee, Wis., announced the installation of a new centrifugal pump test floor, which contains the most efficient and accurate commercial pump test facilities ever developed.

In this new installation, with its efficient and accurate testing facilities, there is a virtual elimination of the possibility of human error. Practically all operations are simplified and mechanized. For the first time the volume of water flow is measured by weight, utilizing a specially developed electronic timing device. Other accuracy comes from such innovations as the first application of torque meters for power measurement and pump testing.

The extent to which the possibility of human error has been removed can be judged from the fact that torque, speed, pressure, and vacuum are all read on automatic recording instruments and, except for adjusting the discharge valve, the operator can control all phases of pump testing from a master control panel.

It is expected that the new units will result in reducing test time and labor by about 60 per cent, thereby aiding in the improvement of shipment time on pump orders.

Purpose of Pump Testing

The company has long had a policy to obtain performance data on every pump it builds. Sometimes pumps are too large for plant testing facilities. In such cases, tests are made in the field. It is felt that it is important to make sure that a pump does not materially exceed its rated performance. This is one of the reasons for making such tests. Furthermore, the files of performance data maintained by the company can assure the user that he can obtain data on performance of a pump under conditions other than those for which it was purchased.

Description of Test Stands

The new testing facilities have three permanent test stands. They are similar in design, but are equipped to handle pumps with different horsepower and speed requirements. From these three test stands, it is expected that most of the units built by the Allis-Chalmers Company can be tested at this location.

Each test station has a test stand for mounting the pump and small discharge pipes mounted overhead, means for connecting the meters and gauges in the control room, a hydraulic pump and motor and a hydraulic control panel. Pumps are adjusted to the proper height for the motor, on a movable support. This pump test table is mounted on a hydraulic cylinder, which can be raised and lowered as necessary. The motor, torque pickup, frequency generator unit and motor half of the coupling are all mounted as a unit on a sliding base, which can be moved toward or away from the pump test table by hydraulic power, making it possible to give absolutely correct connections with the pump. Motors can be exchanged, when necessary, for different sized pumps.

Interior of Control Room

Control Circuit

By means of a new application, worked out with the Toledo Scale Co., automatic actuation of test control circuit is accomplished through utilization of the motion of the scale weight indicator mechanism, as weight is added to the scale. Photoelectric cells are used in connection with this operation, and by means of ingenious electronic controls it is possible to record the actual weights for any given time interval.

Control Room

The nerve center of the test floor is the control room, shown in the accompanying photograph. In this control room, all operations in the testing of a pump are carried out, with the exception of setting of the discharge pressure. The control room contains the recording speed meter, the recording torque meter, a recording 30 ft. suction gauge, recording gauges of 150, 250, and 500 ft. pressure range, and a transfer panel on which is given the test weight selector, the start test, emergency stop test, etc. As was stated above, this eliminates practically entirely any manual control of the tests.

Obtaining the Data

The usual commercial tests of a pump consist of making a series of short test runs, each made at different discharge pressure, during which a predetermined amount of water is pumped in a carefully measured period of time. During each run, the following data are recorded: Pump suction and discharge pressure, power input to pump and pump speed. These are continuously measured and recorded on automatic recording meters. The speed with which all of these data can be collected is apparent when one learns that it seldom requires more than twenty minutes for a complete test.

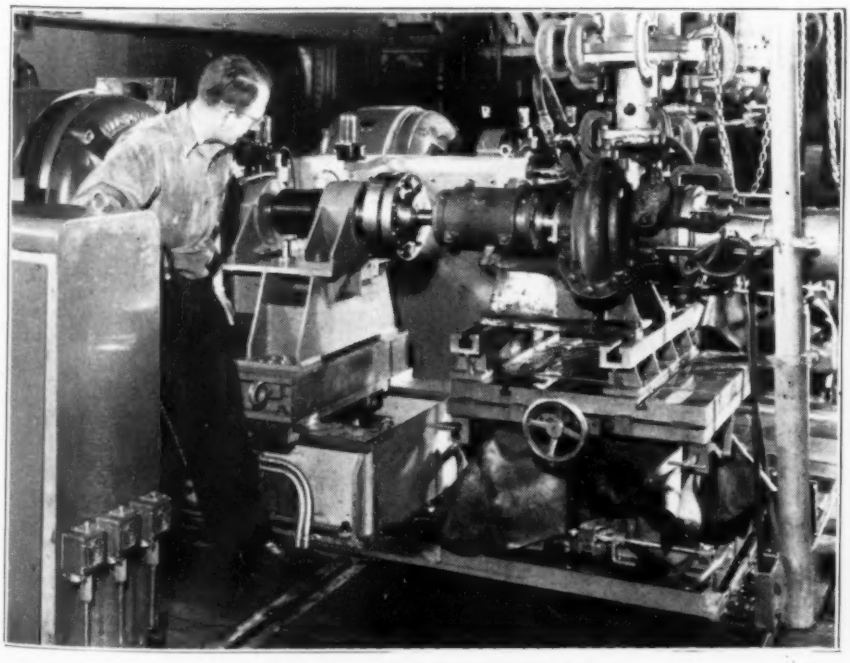
The pump capacity in gal, per min. is measured by the weight of the water discharged from the pump into a weighing tank. When a predetermined amount of water has been pumped, the tank is emptied. A timing device reading in thousandths of a minute, starts and stops automatically at the beginning and end of the test period. From this time and the weight of the water, it is possible to determine the discharge of the pump in gpm.

Horsepower is calculated as a product of the pump speed and the torque input into the pump. Five different speeds are used in testing pumps. These are obtained with induction motors having a variety of synchronous speeds.

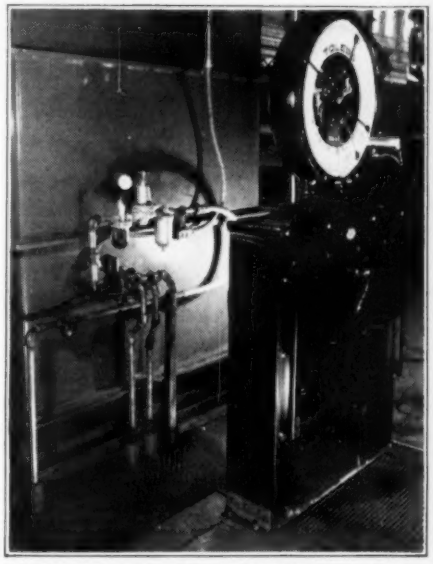
Suction and discharge pressure measurement are made on continuous recording gauges mounted in the control room.

Testing Larger Pumps

Certain types of multi-speed pumps are too large to enable them to be mounted on one of the three permanent test stands. If their discharge volumes are within the capacity of the weighing equipment, the pump is set up on the floor between the test stands in front of the control room and a test made.



Centrifugal Pump Being Tested on Stand A



Weigh Tank Scale and Air Piping to Dump Valves Stand

Condensate pumps are a special class of equipment required to remove liquid from the space in which the pressure is extremely low. To test these, the pumps are connected to a dummy condenser.

Comparison with Former Methods

Allis-Chalmers Co. is of the firm opinion that this new method of making tests on pumps is far superior to any former methods used. For example, the method of measuring the volume of water by weight, rather than by use of Venturi meters or other devices, is more accurate than any other method. At the same time, the control of the test becomes automatic, as does the recording of the data, thereby reducing the possibility of human error and speeding up test work.

Other advantages of the new test methods are its accuracy of determining horsepower, and the ease of general operation and recording of data automatically, rather than by human operators.

Furthermore, ordinary pump test setups are obviously more inefficient. By means of the various adjustments available in this pump test floor, it is possible to hook up the proper size motors correctly and to line up the whole pump setup properly with ease and complete accuracy.

Although the new pump test floor has been in operation but a short time, it is apparent that the results are not only more accurate, but much more efficient and time-saving. The time formerly required to set up a test of a pump averaged about four hours. The average with the new facilities seems to be about one hour, with the possibility of further reductions.

N. Y. STATE SEWAGE WORKS ASSN. SPRING MEETING

Kingston, N. Y. Sessions Draw Large Attendance

MEETING in Kingston, N. Y., on June 6-7, the New York State Sewage Works Assn. held its annual Spring Meeting at the Governor Clinton Hotel. Approximately 150 members and guests attended the sessions, which were presided over by PAUL BARDET, Superintendent of Sewage Treatment at the 26th Ward Treatment Works in New York City, and President of the Association; and Prof. CLARENCE J. VELZ, Head of the Civil Engineering Department of Manhattan College, as Chmn. of the Program Committee.

A feature of the program was a panel discussion on Screening, Shredding, Comminuting and Grit removal. The panel leader was STANLEY T. BARKER, Chief, Sewage and Waste Section, State Department of Health, Albany, N. Y. Participants in the session included A. J. Fischer, The Dorr Co., New York; J. J. Gilbert, Link-Belt Co., Philadelphia; J. M. MacCrea, Chicago Pump Co., Syracuse, N. Y.; Uhl T. Mann, Supt. of Ley Creek Plant, Syracuse, N. Y.; Earl F. O'Brien, Consulting Engineer, Syracuse, N. Y.; A. J. Scanlon, Chief of Maintenance and Operations, Bureau of Sewage Disposal, New York City; S. L. Tolman, Jeffrey Manufacturing Co., Columbus, Ohio; and H. M. Weil, Chain Belt Co., New York, N. Y.

Stream Standards

The most thought-provoking paper of the program was that presented by Charles C. Agar, Chief, Stream Pollution Section, State Department of Health, Albany, N. Y., Mr. Agar spoke on **"Stream Standards and Their Practical Application."**

In beginning his presentation of the topic, Mr. Agar pointed out the responsibilities of the new Stream Pollution Control Board in New York State. These responsibilities consist of prevention of new pollution and abatement of existing pollution. The act creating the Stream Pollution Control Board provides for the establishment of standards of quality for various uses and classes of waters within the state. It is therefore evident that there must be stream standards set up in New York State, but that these can be for sections of a stream or a whole stream, as may be desired.

Mr. Agar is of the firm belief that stream standards are a more reasonable approach to the subject than are effluent standards. He believes that standards must not be inflexible —that they may be set for periods of five to ten years, but that they may be adjusted, as desired. Furthermore, these stream standards must be justifiable and equitable.

In discussing the possible stream classifications, Mr. Agar set up five somewhat as follows:

A. Waters containing natural runoff and no waste;

B. Waters on which there are some habitation and slight pollution;

C. Moderately polluted waters;

D. Waters containing considerable pollution; and

E. Grossly polluted waters, where nuisance conditions exist.

For New York State, there must also be classifications of waters for salt water and tidal water basins.

In setting up standards, Mr. Agar believes that there should be a minimum effluent objective, which shall consist of (1) practically complete removal of settleable solids; (2) removal of floating solids and oils and grease; (3) absence of acid or alkaline condition; (4) absence of toxic chemicals; and (5) a reduction of BOD of the effluent to allow at least 5 ppm. of dissolved oxygen in the stream.

From that point on, Mr. Agar presents an entirely new and unique idea in stream standards. Once a stream standard is established, it is possible to determine the actual quality of the effluent required for any individual industry. Where many industries exist, one must, according to Mr. Agar, determine the zone of influence of each. This raises the question of how that zone of influence is to be determined.

Mr. Agar suggests that the first step is to use 70 per cent of the stream's available capacity and to allocate that 70 per cent to the industries, then to determine the effluent standards. He believes that an equitable allotment of the use of streams up to 70 per cent of its capacity for handling waste should be based on many factors. These may include population, volume of waste, strength of waste, assessed valuation of property, local taxes paid by the industry, number of employees, size of payroll, and value of products.

Mr. Agar believes that it is possible to devise a formula to include all of these factors. As an example, he cited a phenol waste from three industries. To develop the allowable allocation of phenol output from the three industries, Mr. Agar based the allocations on volume, employees, valuation and phenol. Arbitrarily, for this example, he assumed relative weights for each of these factors and developed an allocation accordingly. For a particular example, he allocated 20 per cent to volume, 30 per cent to number of employees or payroll, 30 per cent to valuation or taxes and 20 per cent to the phenol discharge in pounds per day. Using these assumed relative weights, he then allocated the actual allowable discharge of phenol by the several industries.

Mr. Agar believes that this type of allocation can be done for each type of waste and on the basis of oxygen demand or any other criterion desired. Each industry, after such an allocation, would then have to meet the standard on an effluent load basis. Mr. Agar points out that the standards can be revaluated at regular intervals, but that they should be determined on the basis of low flow. If and when such basis is adopted, Mr. Agar expects at least a 10-year period necessary to assay the stream pollution of New York State and develop standards.

Other Topics Discussed

Among the other topics discussed at the meeting were high rate filtration, digestion of tannery and sewage sludge, automatic chlorination of sewage, treatment of industrial wastes, and combined sewers.

At the Annual Dinner meeting the presentations of rating awards were made, following which BERNAL H. SWAB of the firm of Jones, Henry & Schoonmaker, Toledo, Ohio, presented films taken on a special cross-country train to the FSWA Convention in San Francisco in 1947.

(Editor's Note: We regret that space does not permit a complete coverage of all of the papers presented at this meeting.)

DETERMINATION OF FIRST-STAGE OXYGEN DEMAND

by
GEORGE A. RHAME
Sanitary Engineer (SP)
FORT JACKSON, S. C.

IN CONTINUATION of the line of work reported by various investigators in the effort to arrive at a reliable means of approximating the true strength of sewage (in terms of reducing power) with reasonable rapidity, this writer came to the conclusion that the most promising line of attack would be that of measurement of the total first-stage or carbonaceous oxygen demand. It has been well established that the reaction velocity constant in the standard oxygen utilization curve is subject to considerable variation, when measured by dilution technics, from place to place, and even from sample to sample in any one place. This variation in "k" will cause quite a variation in the relationship between the conventional 5-day B.O.D. and the total first-stage demand. (Fig. 1)

Many of the apparent discrepancies in the data on treatment plant performance found in the literature may be due to the fact that an item of fundamental importance is nearly always omitted. In the standard B.O.D. test, we measure "Y" for whatever interval of "t" days we wish in the oxygen utilization formula

$$Y = L\,(1 - 10^{-tk})$$

while ignoring the factors "k" and "L" altogether. Thus our data, no matter how extensive, are still incomplete. The biological treatment plant will bring about in a few hours a degree of oxygen utilization which, in the standard B.O.D. test, is accomplished only in days. The relation between plant loadings and performance (in terms of 5-day B.O.D.) is subject to many variations simply because the principal load factor, the total first-stage demand, has only been approximated. The factor "k" is subject to great variations even in the constant-temperature dilution bottle of the laboratory determination, thus considerably distorting the theoretical relation between "k" and "L".

This writer believes the second-stage oxygen demand of sewage to be of considerably less importance from a treatment standpoint (except where highly nitrogenous trade wastes are present) for purely practical reasons. Eliassen[1] has shown that where it is desired to maintain in the stream receiving the treatment plant effluent, sufficient dissolved oxygen to support fish life (about 3 ppm. minimum), the oxidation-reduction potential is so great that nitrites, nitrates, and sulfates cannot function as oxidizers and will have little effect on this aspect of receiving stream conditions.

The Author

Determination of "k" and "L"

Measurement of the total first-stage B.O.D. in the average sewage treatment plant laboratory presents a number of practical difficulties, even when using the relatively simplified methods of Fair[2] and Thomas[3]. The situation was further complicated in the writer's case by the necessity of working on this problem in "spare time". A method was finally worked out in which the dilution B.O.D. is determined only for the three- and six-day intervals, with simplified mathematical treatment. The selection of the three-day period was influenced by the work of Butterfield and Wattie[4], who suggested that for incubation periods of three days or more, variations in the initial numbers of bacteria in a diluted sample would have little effect on the B.O.D. This statement was found to be not strictly true in this work. The six-day period is believed to be the longest which will reliably avoid the onset of second-stage B.O.D. in raw and settled sewage.

To determine "k" and "L" using the standard dilution technic, calculations were made with the following formulas:

$$(1)\quad k = \left(\frac{1}{T - t}\right) \log \left(\frac{x}{y - x}\right)$$

where

T = 6 (days);
t = 3 (days);
x = ppm. 3-day B.O.D.;
y = ppm. 6-day B.O.D.

$$(2)\quad L = \frac{x'y - y'x}{x' - y'}$$

(x and y as in formula 1)

$$\left(x' = \frac{x}{3} \quad y' = \frac{y - x}{3}\right)$$

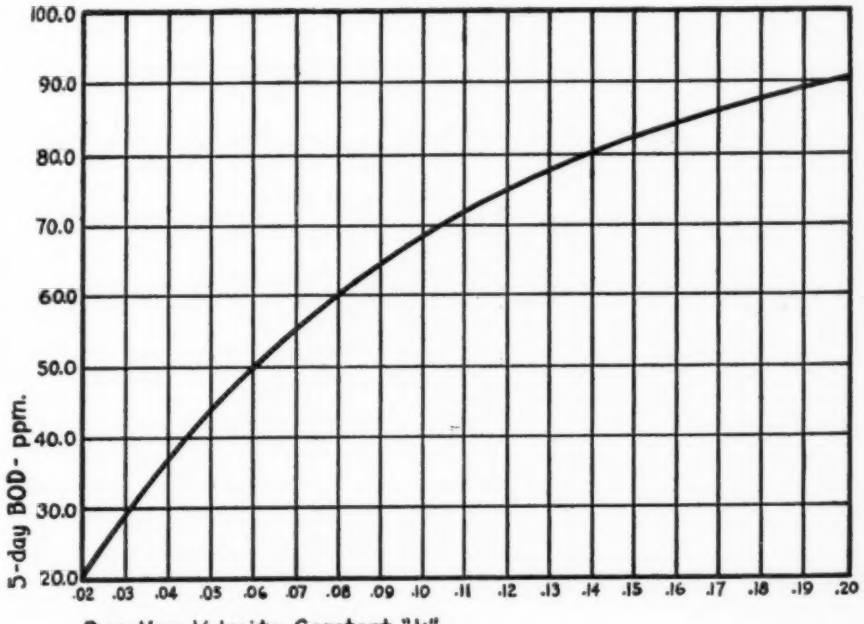


Fig. 1. Effect of Variation in "k" on the Value of the 5-Day B.O.D.
(Ultimate first-stage B.O.D. "L" is 100 ppm.)

Table I

SETTLED SEWAGE

All samples from Fort Jackson Sewage Treatment Plant. Values in ppm.

Sample	3-Day BOD	5-Day BOD St. M	5-Day BOD calc.	6-Day BOD	"k"	calc. ult. BOD	ult. BOD by OC test
#1	75	117		155			173
	80	110	108.8	115	0.10	160	167
	80	110		120			156
#2	72	95	96	107	0.086	153	164
	66	93		107			169
#3	64	85	84	98	0.094	135	136
#4	68.3	90.0	90.7	98	0.120	121	146
#5	140	170		193			228
	110	123	160	180	0.122	223	234
	133	183		190			226
#6	80	103		117			142
	82	97	107	110	0.111	149	138
	80	107		120			140
Ave.		109	109		0.106	157	164

All medians used for calculations.

Formula (1) was derived algebraically from the standard formula; formula (2) empirically from those given by Thomas. The 5-day B.O.D. was used as a check on the reliability of these results by comparing it with the 5-day value calculated from "k" and "L" as determined above.

Although the results of calculations from these over-simplified formulas and procedures are not as precise as those of the more extended methods they are close enough for practical purposes. For instance, if we assume L to be 210 ppm. and k to be 0.18, we may enter the standard formula and find that the 3-day B.O.D. is 149.5 ppm. and the 6-day is 194.7 ppm. When these values are entered in formulas (1) and (2) we find L = 214 ppm. and k = 0.173. Furthermore, the calculated and observed values of 5-day B.O.D. in the accompanying tables show a similarly close agreement.

Developing a Method

Since a good part of this work was done before the release of the 9th Edition of "Standard Methods" the entire work was carried through with the bicarbonate dilution water with which it was started.

As a treatment plant operator, the author was primarily interested in developing a method of analysis which would not only more correctly reflect the load on biological oxidizing devices but would also give results quickly enough to be used in process control. Accordingly, an Oxygen Consumed test was evolved and co-ordinated with the results of the dilution procedure. The technic used was developed from one previously described by this author[5]. Nichols and Murray[6] also presented an improved, and very interesting, version of the same. Since both of these versions of the Oxygen Consumed from dichromate attempted to approximate the results of the 5-day B.O.D. test, they were not very successful because of the aforementioned variations in the value of "k".

Burtle and Buswell[7] and others have shown that the carbon in most pure organic compounds is very nearly completely oxidized by a chromic-sulfuric-phosphoric acid mixture, so the investigation began by testing plain settled sewage in order to determine the proper reaction time, with procedures laid out along lines designed to keep the o.c. reaction time reasonably short. Settled sewage was chosen for its relative uniformity, freedom from gross particles and the absence of second-stage B.O.D. during the period of the dilution tests.

Table II

RAW SEWAGE

All samples from Fort Jackson Sewage Treatment Plant.

Sample	3-Day BOD	5-Day BOD St. M	5-Day BOD calc.	6-Day BOD	"k"	calc. ult. BOD	ult. BOD by OC test
#1	107	115		110			254
	107	110	118	120	0.305	122	256
	107	115		130			258
#2	120	190		190			292
	117	185	178	210	0.0499	410	288
	130	210		205			284
#3	110	137		193			218
	95	147	136	153	0.0714	243	222
	95	178		150			264
#4	152	200		175			280
	142	203	184	195	0.162	218	332
	147			205			290
#5	115	117		130			276
	92.5	167	117	120	0.131	150	228
	92.5	110		147			208
#6	125	152		197			320
	110	170	177	210	0.0799	293	304
	130	150		167			372
#7	130	197		175			266
	132	177	165	170	0.153	199	258
	125	183		180			254
Ave.		158	148		0.132	236	263*

Sample #4 not used in obtaining averages.
*Average of medians.

Table III

RAW SEWAGE

All samples from Fort Jackson Sewage Treatment Plant. All samples strained except those in col. 3.

Sample	3-Day BOD	5-Day BOD	5-Day BOD	5-Day BOD calc.	6-Day BOD	"k"	calc. ult. BOD	ult. BOD OC test
#1	118.5	170.0	160.0		175.0			252
	157.5	206.1	163.3	146	185.0	.0751	253	256
	110.0	166.7	173.3		155.0			270
#2	100.0	160.0	105.5		110.0			244
	90.0	150.0	120.0	107	120.0	.218	117	276
	83.3	110.0	100.0		110.0			248
#3	90.0	120.0	123.3		146.7			225
	82.5	143.3	120.0	126	130.0	.0850	202	235
	92.5	156.7	123.3		140.0			245
#4	57.5	96.7	73.3		103.3			180
	60.0	90.0	86.6	87	96.7	.0711	155	166
	67.5	90.0	76.6		90.0			156
#5	66.0	105.0	90.0		92.5			146
	60.0	87.5	87.5	84	102.5	.888	131	138
	58.0	87.5	90.0		87.5			158
#6	123.3	165.0	150.0		165.0			288
	126.7	165.0	175.0	160	180.0#	.125	256	282
	135.7	180.0	165.0		150.0			310
#7	140.0	220.0	200.0		410.0			396
	160.0	240.0	230.0	217	240.0#	.0865	343	400
	155.0	230.0	210.0		270.0			360
Ave.		147.6	138.0	137		.0887	223	248

NOTE: All calculations based on median except where indicated by #; sample 2 omitted from averages.

Results

Results of the work with settled sewage (Table I) showed a high reliability for the dilution method, as evidenced by the close agreement of observed and calculated 5-day B.O.D. and agreement between o.c. and dilution values for L close enough for practical purposes. Proceeding to raw sewage, the dilution results were fairly good, but o.c. demands were much too high, due to the presence of paper, etc., which does not enter into the biological action in the dilution method (Table II).

With the intention of reducing the effect of these particles of paper a series of tests was run in which all samples were strained through ordinary fly-screen. (Table III) Here again the dilution method checked out nicely but the chemical demand was high. Since unstrained portions of the samples showed a higher 5-day demand than the strained, another set was run in which only the o.c. portion was strained (Table IV), with results very similar to those of Table III.

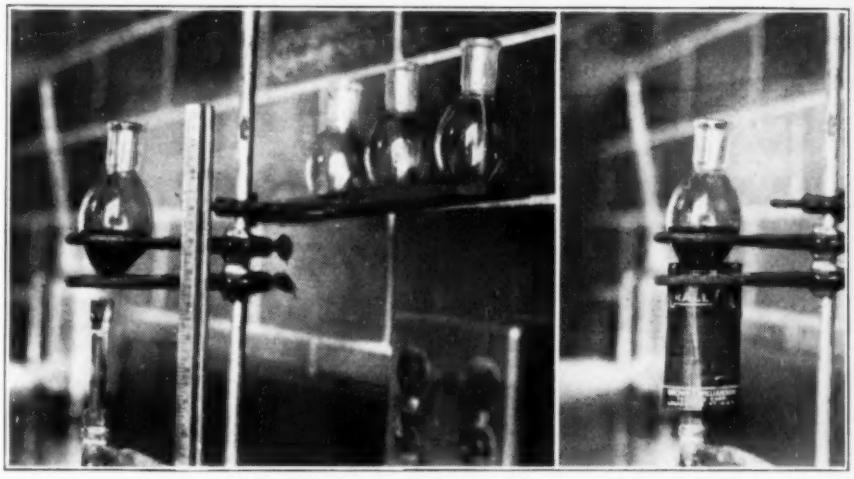


Fig. 2. Apparatus Assembly for Oxygen Consumed Test

(Note relation of burner position to flask. Right, shield is in place to insure steady flame)

Table IV

Dilution method (col. 2, 3 & 5) samples not strained—OC samples strained.

Sample	3-Day BOD	5-Day BOD	5-Day BOD calc.	6-Day BOD	"k"	calc. ult. BOD	ult. BOD by OC test
#1	62.5	130.0		100.0#			200
Ft. J.	67.5	90.0	91	86.7	.0896	141	148
	65.0	90.0		73.3			148
#2	225	390		340			416
Greenw'd.	245	320	313	350	.107	441	436
	230	320		310			464
#3	155	200		240			296
Ft. J.	135	180	180	190	.169	210	286
	145	230		180			306
#4	173	245		265			324
Ft. J.	180	230	232	230	.137	294	288
	180	235		250			332
#5	233	250		285			322
Greenw'd.	240	285	277	285	.242	295	364
	243	343		305			348
#6	93	150		125			222
Ft. J.	103	105	137	145#	.129	176	214
	110	130		120			232
Ave.		210	205		.146	259	296

All calculations on medians except where indicated by #.

NOTE: Sample #5 has unusually high proportion of laundry waste and considerable textile waste (without dyes).

Sample #2 contains considerable dye-and meat processing wastes.

Table V

Raw Sewage

Dilution method samples seeded with primary effluent—OC samples strained —non-seeded samples in column*.

Sample	3-Day BOD	Calc. 5-Day BOD	5-Day BOD	5-Day* BOD	6-Day BOD	"k"	Calc. ult. BOD	ult. BOD by OC test
#1	173		225	205	240			256
Ft. J.	190	185	220	190	210	.156	222	248
	163		230	205	210			250
#2	290		380	310	340			394
Ft. J.	285	338	360	330	400	.226	366	372
	290		390	330	350			388
#3	200		350	230	250			220
Ft. J.	235	238	260	240	240	.413	241	232
	227		260	190	200			252
#4	235		260	330	300			300
Ft. J.	250	288	260	300	290	.201	320	328
	240		260	290	300			328
#5	190		200	130	350			242
Ft. J.	176	267	220	160	220	.108	362	268
	205		210	140	280			258
#6	300		400	340	430			568
Greenw'd.	350	407	540	350	540	.170	473	568
	330		480	360	420			532
#7	225		280	270	340			370
Ft. J.	250	325	290	290	400	.148	397	370
	250		400	300	310			370
#8	250		330	370	320			360
Ft. J.	270	296	300	280	320	.227	319	380
	265		320	320	300			372
Ave.		293	303	268		.209	338	337

NOTE: All medians.

Review of the work of Thomas[3] suggested that the lag-period at the beginning of the dilution tests was having a much greater effect than had been expected on the basis of the work of Butterfield and Wattie[4]. In order to eliminate this lag and its depressing effect upon the calculated value of "L" a set of samples was tested in which the dilution B.O.D.'s were determined with seeded dilution water, using fresh settled sewage as seed (Table V). The calculated and observed 5-day demands again check well and the average agreement between o.c. and B.O.D. values for ultimate demand was good, in spite of considerable random variation. (Note, however, the discrepancies between seeded and unseeded 5-day results. Such a difference suggests that many cases of apparently poor B.O.D. removal through settling tanks that are found in treatment plant operation may be due to this lag-effect in the conventional 5-day determination.

An interesting side-issue and confirmation of the validity of the o.c. procedure developed when it was found that the residue of this test would, when subjected to alkalization and distillation as in the Kjeldahl method, give results for total nitrogen comparable to those of the standard method. Final results given in Table VI were arrived at by Nesslerization of the distillates. The possibilities of this procedure as a quicker method for obtaining total nitrogen (without the nuisance of sulfuric acid fumes) have been discussed by this writer in a previous publication[5].

Analytical Procedures

(1) For "k" and "L" by dilution method.

Prepare 3- and 6-day dilutions according to Standard Methods. Use seeded dilution water for raw sewage. The sample should be mechanically stirred during the entire period of withdrawal of portions for dilution. Determine B.O.D. and calculate "k" and "L" with formulas (1) and (2). Five-day demands may be determined as a check on these results. This writer found results more consistent by using for calculation the median of three identical dilutions for each incubation period.

(2) For Oxygen Consumed Test for Ultimate First-stage demand.

Reagents:

(a) Sodium Iodide, 20 per cent solution in distilled water.

(b) A mixture of 50 per cent sulfuric acid and 50 per cent ortho-phosphoric acid, with sufficient potassium dichromate added to make the solution about 0.025 N to sodium thiosulfate. The dichromate may be dissolved in a small quantity of distilled water and added to the acid.

(c) 0.025 N sodium thiosulfate as used for dissolved oxygen.

(d) Starch solution as used for dissolved oxygen.

Apparatus:

(a) 125 ml. Acetylization flasks (Corning No. 4040, without condenser tubes)

(b) Ringstand, iron rings (3 inch outside diameter), burner and burner shield set up as in photo. Adjust flame height to overlap tip of flask about ⅜ inch. The shield is necessary to insure a steady flame. Operate burner with air ports closed.

(c) Clock or timer of a type easily read to ½ minute.

Prepare a blank consisting of 10 ml. distilled water and 20 ml. of acid mixture, mix well (hold up to light and see that all "wrinkles" have disappeared). Boil for six (6) minutes from the time that small bubbles first appear steadily. Remove from flame and allow to cool.

Prepare sample for testing by straining through ordinary fly-screen. (16 mesh). (Ed. Note: Perhaps the use of a laboratory collander, such as the Waring Blender, on the original samples would produce more consistent results where paper particles are present.) Keep sample well mixed at all times. Place ten ml. of sample in flash and treat same as blank. Begin heating flask as soon as possible after acid and sample are mixed. If sewage is very strong, use less sample and make up to ten ml. with distilled water.

When acetylization flask has cooled to a comfortable handling temperature, pour contents into a 500 ml. Ehrlenmeyer flask. Rinse out acetylization flask with distilled water, pouring rinsings into Ehrlenmeyer flask. Use enough rinse water to make final volume of rinsings and acid mixture about 250-300 ml. Add 3 ml. of the iodide solution, mix well and titrate immediately with 0.025 N sodium thiosulfate.

Subtract the ml. of thiosulfate used for titration of the sample from that used for titration of the blank.

$$\text{Calculation: } L = \frac{200 \times \text{diff. in titrations}}{\text{ml. of sample}}$$

Summary and Conclusions

Data have been presented comparing the results of two relatively quick and easy methods for estimating the total first-stage B.O.D. of raw and settled sewage. Since all procedures have of necessity been reduced to the simplest forms, it is the belief of the writer that they may be of some significance in sewage treatment plant operation and stream pollution problems.

Although the mathematical treatment of the dilution procedure is somewhat oversimplified, its results check reasonably well with those shown by Thomas[3]. In his "Group B, Influent Seeded" he calculated the total first-stage oxygen demand of the sample to be 115.5 ppm. and "k" = 0.178. Applying formulas (1) and (2) of this procedure to the same data gives an ultimate first-stage demand of 118.6 ppm. and "k" = 0.168, with errors of 2.8% and 8.4% respectively, which are somewhat greater than those for the theoretical calculations shown earlier in this report. (The three-day demand needed for these formulas was estimated to be 80 ppm. from the Thomas graph.) Unfortunately, circumstances did not permit a direct comparison of these procedures with that of Thomas.

Accuracy of the dichromate method probably would be improved by development of a technic permitting use of larger samples, but present information indicates that the use of large quantities of phosphoric and sulfuric acids would make this impractical for general use. Note, however, that the 10 ml. samples used here are within the range of those generally employed (per bottle) in the standard dilution method.

Use of the total first-stage B.O.D. as a measure of sewage strength should make possible a more rational expression of the relationship between treatment plant loading and performance. The fact that under conditions of plentiful oxygen supply and continuous agitation the greater part of the first-stage demand will be satisfied within a few hours has been amply demonstrated by laboratory work with various types of Odeeometers and put to practical use in treatment plants employing aeration without activated sludge. In biological treatment plants this same degree of treatment is accomplished in even less time because of the great concentration of seeding material. It is only by estimating the total oxygen demand that we can eliminate the discrepancies between analytical data and plant performance which arise from the unpredictable relationship between the rate of oxidation in the treatment plant and the laboratory dilution bottle. It is the belief of the author that the first-stage portion of this demand will prove to be the decisive factor in the majority of cases—and, if necessary, the second stage demand may be estimated with comparative ease using conventional procedure.

Use of the first stage demand is also indicated in the study of sewage pollution loading on streams. The work of Kittrell and Kochittsky[9] has shown that conditions may frequently approximate those found in biological treatment plants in the matter of rapid rate of oxidation, thereby greatly decreasing the utility of the standard 50-day B.O.D. in evaluating a stream's pollution receiving capacity. The present dissolved oxygen content of a stream will show whether or not it is loaded too heavily, but predicting how much more may be handled, or of how much the load should be reduced, is a difficult problem. H. A. Thomas, Jr.,[10] has produced a simplified mathematical procedure capable of solving these problems but depending upon total demand as primary data. For reasons cited earlier, the writer believes that first-stage demand could readily be used in this connection (see also Eliassen[1]), and that only by use of such simplified

Table VI

Total Nitrogen by Kjeldahl Method and OC Modification.

Sample	Kjeldahl	OC Modification
#1	20	24
#2	24	30
#3	18	14
#4	16	13
Average	19.5	20.2

NOTE: Final values by Nesslerization of distillate.

analytical procedures will these potentially useful formulas become generally available to plant operators and engineers.

Acknowledgments

The writer wishes to express his gratitude to G. M. Speed, Post Sanitary Engineer, whose co-operative attitude made this work possible; to J. H. Stephens, Director of the Division of Sanitary Engineering, S.C. Board of Health, who with his typists did all the drudgery; and especially to the friends who patiently listened to me talk about this even though they were not in the business.

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F. S. Friel Receives Honorary Degree

Drexel Institute Awards Doctor of Engineering

Francis de Sales Friel, President of Albright and Friel, Consulting Engineers, Philadelphia, Pa., was awarded the honorary Doctor of Engineering degree at Drexel Institute of Technology on June 20.

Mr. Friel was presented to the President of Drexel University for the degree with these words: "For the degree of Doctor of Engineering, honoris causa, Francis de Sales Friel, Alumnus of Drexel Institute of Technology, eminent consulting engineer and public spirited citizen of our community, who has made notable contributions to the health and prosperity of our people through his skill in sanitary technology, and to the security and well being of our country through his public services in both peace and war."

The presentation also included a brief summary of his work as a consulting engineer and of his various other honors, including the past presidency of the Pennsylvania Sewage and Industrial Wastes Association, the Philadelphia Section of the American Society of Civil Engineers, and of the Federation of Sewage Works Associations. In 1948 he represented the A.S.C.E. at the Third International Congress on Large Dams in Stockholm, Sweden, and the Second International Congress on Soil Mechanics at Rotterdam, Holland.

OHIO INAUGURATES MOBILE LABORATORY STUDIES OF STREAM POLLUTION

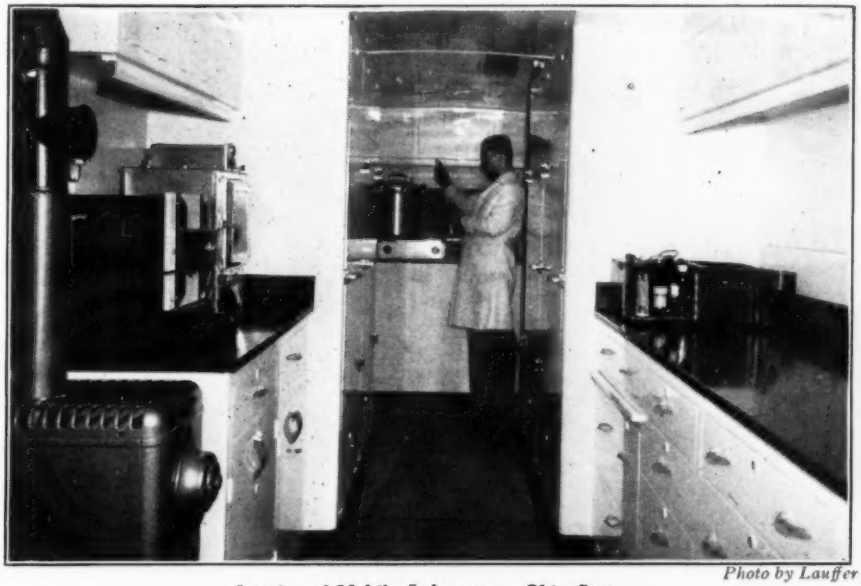


Photo by Lauffer

Interior of Mobile Laboratory, Ohio State

As a part of its share of the Ohio River Compact Commission pollution abatement efforts, the state of Ohio has put into the field a new mobile laboratory. The first assignment of this new laboratory is for a study of the Miami River, one of the major streams of Ohio.

This mobile unit was designed by members of the staff of Ohio's Dept. of Health under the direction of F. H. Waring, Chief Engineer, and M. H. Riehl, Chief Chemist. Towed by an 8-cylinder Pontiac station wagon, the laboratory is completely contained within the 25-ft. trailer. The station wagon can be used as a field car in the collection of samples. Provision is made for quick connection to water and electric services, should it be necessary to operate in one location for any period of time, but it is expected that the completely self-contained features of the laboratory will minimize such permanent connections.

The value of mobile laboratories for pollution studies was first demonstrated by the U.S.P.H.S. during its study of the Ohio River some years ago. The Ohio laboratory is a refinement of these earlier designs and is believed to be the only mobile unit of its kind operated by a state health department.

PENN STATE PLANS WATER WORKS SHORT SCHOOL

Following the success of the short schools in water and sewage treatment held last year, and the second short school in sewage treatment held in June of this year, when 53 attended, Pennsylvania State College has planned to hold its Second Annual Pennsylvania Water Works School in State College, Penna., Sept. 19 to 23. For further information on this school, address your inquiry to Prof. Robt. E. Stiemke, Dept. of Civil Engr., Pennsylvania State College, State College, Penna.

THE BIO-PHAGE NUTRIENT PROCESS OF SEWAGE TREATMENT

Is It A Day Dream, A Nightmare, or A Crystal Gazers Look Into the Future?

by
F. P. FISCHER
Dist. Mgr.
WALLACE & TIERNAN CO.
CLEVELAND, OHIO

IN these days of tremendous activity, the development of the biochemical sciences has been stimulated as never before. Hormones, enzymes, vitamins, rays (beneficial and alterative, as well as destructive) have been studied and explained with a zeal completely in character with the times. Nutrition, both human and subhuman, has become extremely important. Biological processes, so reluctantly discussed with respect to their effects on man have been explored and developed; for example, to increase egg and milk production, and controlled feeding and breeding also have resulted in significant changes in physical structure of both fowls and animals. Inasmuch as the life cycle of these animals is short, it is more reasonable to justify the relative progress for the development of a hen bred to lay 250 eggs or more per year than it would be to attempt to change the elephant.

Some Basic Considerations

If, however, we follow that line of reasoning, then efforts expended on the processes of those forms of life that pass through their biological cycle in a matter of minutes should certainly be rewarded. In order to provide a suitable foundation for that hypotheses to follow, it is necessary to propose these basic assumptions:

1. *No* organism can survive in an environment of its *own* wastes.
2. Lower life forms *can* exist in or on the wastes of higher forms.
3. When no form of life can exist, a substance is sterile, inoffensive, and no longer may be considered as waste material, having completed its biochemical cycle.

One or the other of the above may be more basic than others, but that relation has no effect on the thesis of this dissertation.

Perhaps at this point a suitable definition for environment should become a part of our assumptions. For the purpose of this paper, we shall assume that a suitable environment is that state or condition which will permit the completion and continuation of the life cycle of an organism.

Inasmuch as we have qualified the word "environment" by the adjective "suitable," there is no reason to believe that "suitability" may not be improved and developed. As indicated above, selective breeding has been responsible for increased milk and egg production. Selective seeding has resulted in remarkable results in the field of fermentation. Proper nutrition and the stimulus of hormones and vitamins has been responsible for increased development and growth in man, animals and plant life. It would be presumptuous of this author to even infer that he knows by what devious processes these developments take place. It does, however, by analogy, stimulate our imagination to *suspect*, at least, that *all* forms of life could be so stimulated and their environments could be so adjusted. Then processes utilizing these forms of life could attain a degree of efficiency that is at present merely a dream, or a nightmare depending on your point of view.

The Author

For a number of years, scientists have been developing fermentation procedures and equipment involving the use of specially developed organisms under controlled conditions in order to improve the efficiency of such processes. For a number of years, too, engineers, chemists, and biologists working in the field of sewage treatment have discussed somewhat semi-seriously, the possible application of such technics to sludge digestion.

Now comes Mr. Fischer with an even broader application of this technic to the whole process of sewage treatment. Is Mr. Fischer a seer, peering into the future, or is he having a day dream—or a nightmare—or is he pulling our leg?—Whatever his intention in writing this article, we believe that it is provocative of thought and comment. The Editors.

Scientific Sewage Treatment

Let us carry this idea into sewage treatment. To say sewage disposal would be incorrect because disposal is inevitable. It is only the means or the results of disposal that become objectionable and accordingly, treatment is usually required. The crescent adorned structure on the farm offered a point of disposal, at least temporarily, but inevitably a problem of treatment or removal became necessary even in this elemental system.

In our more urban subdivisions of life, treatment prior to disposal cannot long be deferred and so, as in industry, batch treatment must give way to continuous operation.

The primary purpose of sewage treatment, obviously, is to permit final disposal of the wastes in such a way that at no subsequent time will they be a source of nuisance, harm, or displeasure to anyone. This could be accomplished by evaporation and incineration; but we must become mercenary and add to the above statement of purpose: "At a cost that the contributor can afford and or will not refuse to pay."

In practice, different methods are employed but essentially they all:

1. Remove trash, grit, etc.
2. Separate solids from liquids.
3. Treat and dispose of solids and liquids separately.

Item one will probably always precede subsequent treatment with such refinement as mechanical ingenuity may evolve. The miscellaneous trash, tin cans, rubber boots, stones and such other items that deliberately or accidentally find their way down our sewers will be a perpetual source of surprise, wonderment, and vexation.

From this point on, however, it is possible to visualize a structure and a process that is completely scientific. This process (at present merely a figment of our imagination) has been given a name: The BIO-PHAGE NUTRIENT PROCESS or, since alphabetical designations are so popular, the B-N process. This process involves the addition, at selected points in the puri-

fication system, of nutrient hormonic infusions together with carefully cultured, robust specific organisms.

A Three-Stage Process

Three separate and distinct forms of the "nutrient organism" infusions will be required. These are listed as Bio-phage nutrients "A", "B", and "C". B-N-A is added to the raw sewage and is selected for its ability to create tremendous biological activity in this environment for short periods of time. In fact, when introduced in proper concentrations, based on the organic solid content of the raw sewage, these organisms will complete their cycle in a very short period of time and will have converted all organic material to a semi-stable condition which will no longer support their existence.

This stage is considered as primary decomposition and is enhanced by mild aeration. It is followed by plain settling. At this point sedimentation is very efficient due to the fact that all colloids are flocculated and all gases have been removed. (See accompanying figure.) In many cases the liquid effluent from the settling tanks is stable enough to justify disposal where sufficient dilution obtains.

The sludge from the sedimentation tank is removed, seeded with B-N-B and added to a small digester, where rapid digestion takes place and solids are reduced to an unbelievable extent. The residual solids are essentially inert, easy to dewater and may be safely used as fill or fertilizer. The supernatant liquor, highly charged with B-N-B, may be added to the effluent from the primary settler immediately counteracting the residual B-N-A.

The liquid phases consisting of the settling tank effluent and digester supernatant liquor is then seeded with B-N-C, if complete treatment is indicated. The amount of this material to be added will depend entirely on the degree of purification and clarification required. Stabilization by this treatment is complete, and fish have been known to double in weight within 30 days when retained and suitably fed in an effluent containing residual B-N-C.

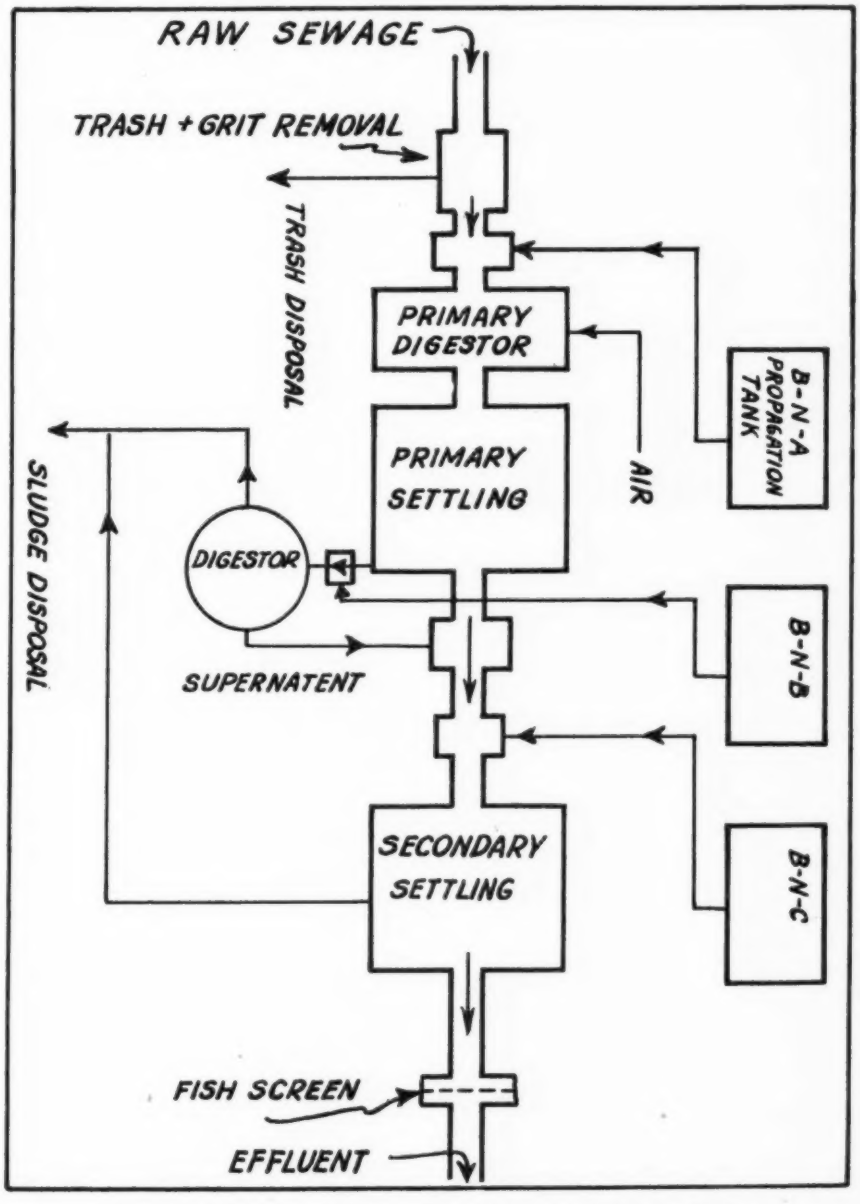
Comments on Process

By providing propagation tanks, supplied with suitable dilutions of the proper hormonic nutrients, pure strains of these selective and specific organisms may be grown in the plants utilizing this process. Unless great care is taken, however, to prevent infection, their virility will decrease, so it is recommended that fresh cultures be procured at least once yearly.

The plant itself is quite conventional except for the fact that sizes of structures may be reduced. Nutrient propagation tanks and increased laboratory facilities will be required. Scientific operation will result in definitely predictable purification the degree of which will be under complete control.

The organisms discussed above are probably now present in domestic sewage, or are accidentally seeded somewhere in the normal plant process. Their ability to do a prompt, efficient job is hindered by their fight to survive in conflict with both higher and lower forms in a common environment that is probably unsuitable for any of them. Commercial fermentation under these accidental conditions has long since been replaced with controlled operation and deliberate seeding with pure cultures. Nutrient and stimulating factors are added to produce predictable results and to give larger yields in a shorter time than would have been considered possible before. There appears to be no valid reason to believe that a similar approach to any organic biological conversion is not possible. It may very definitely be necessary to make certain adjustments such as pH and alkalinity to provide an optimum environment. Destruction of the miscellaneous life forms accidentally present in raw sewage may be required. The elimination of deliberately seeded forms may be necessary before the next cycle is introduced. Aeration at certain points and possibly deaeration at others may be indicated. These adjustments or controls are easily possible with facilities now available.

The field for research is wide open and it is hoped that this article will serve as a "hormonic nutrient" to stimulate thought.



Flow Diagram for the Bio-Phage Nutrient Sewage Treatment Process

The Editor's Comments

We Shall Continue to Go Forward

In listening to the panel discussion on "Water Supply Quality," at the 1949 Annual Conference of the American Water Works Association in Chicago, the seeming attitude of complacency of some of the state public health officials who took part in the discussion proved a disappointment to the writer, who has so long endeavored to produce water of the highest possible quality.

If the interpretation of the remarks is correct, there is a feeling by those state health officials who voiced their thoughts and opinions that the effort to produce water of constantly improving bacteriological quality has gone too far, and that we should slow up and confine future studies to determining the true significance of bacteria that escape chlorination and filtration.

All will agree that we should learn as much as possible about such bacteria and their significance; but many of the water purification engineers and chemists are not in accord with the hint that we have gone too far in improving the bacteriological quality of water. With water-borne typhoid fever almost a thing of the past it is true that further improvement in water quality cannot continue to show any pronounced lessening of the typhoid rate. Our oldest yardstick of the health value derived from water purification has all but vanished, yet extremely few believe we should reduce treatments merely to re-establish the yardstick.

The difference in the cost of producing water that is on the borderline of safety, and water in which there can be no doubt as to safety, is extremely small. In many cities this difference is less than fifty cents per person annually. The figure for the highest cost cities should be less than one dollar a year per person. This is such a small sum added to our living cost and security that it becomes insignificant compared to the value of safe water. Most men spend more money annually for neckties than the cost of water for their entire family. This decoration of dress serves no useful purpose in protecting our body, but it gives satisfaction.

I hope the views expressed by the two or three at the conference do not represent those of most public health officials. After establishing such a brilliant record in years past in promoting improvement in water quality, it would be a blow to progress for such officials to stand by and not lend a vigorous hand in continuing the work for greater protection of the public against the transmission of diseases (some controversial, to be sure) by water. No one has shown that bacteria in *any* form are a desirable or necessary constituent of water.

Official Water Quality Standards are now so far out of line with attainable performance in modern water treatment and filtration plants that they serve as a poor guide in determining how extensive should be the treatment of water. If one should ask a water purification plant operator his aim in water quality, his immediate answer would be to produce water that passes the requirements of the State Department of Health, or the U. S. Public Health Service. Further questioning most likely would reveal that the plant operator is not trying merely to *meet* these official minimum requirements but is striving to produce water that is much better bacteriologically as well as in other respects surpassing the official standards of quality. I am sure most public health officials are disappointed and greatly concerned over the quality of any water supply that is on the borderline of passing requirements.

In years past water purification engineers and chemists have worked side by side with public health officials, each group helping the other. If public health officials now tell us there is no need to go any further in water quality, then the water purification plant operators will lose faith in them as a source of help and guidance in improved plant operation. Chicago's Division of Water Purification already has adopted its own standards of water quality. These standards allow only one-twentieth the number of coliform bacteria in filtered water that is allowed by the U. S. Public Health Service, and only one-hundredth the turbidity. Treatment of the water is changed as need be to maintain this high quality. We shall not lower the quality of Chicago's drinking water merely to save a few dollars.

In the offices at the South District Filtration Plant, the architect provided the Engineer of Water Purification (this being the writer) with a soft easy chair and a beautiful view from broad windows. My efficiency is lessened because it is too easy to look out of the window at the view, or to doze in the easy chair. I have been trying to determine if our architect had in mind only kindness to an elderly person. Since listening to the panel discussion on Water Supply Quality I now wonder if the architect had conferences with certain public health officials who assured him the work in meeting health department standards would be so light that an easy life of complacency would henceforth be in order for those in charge of such plants.

It is my belief that water purification plant operators are not going to stand still in their effort to produce still better water, both in regard to bacteriological quality as well as palatability. We will go forward, with or without the encouragement of public health officials, although we are hopeful that the latter will not come to pass. There is much yet to be done in improving water quality before perfection is reached, and the objectives and endeavors of the treatment plant operator and health official should go forward hand in hand, each helping the other in his highest capacity.

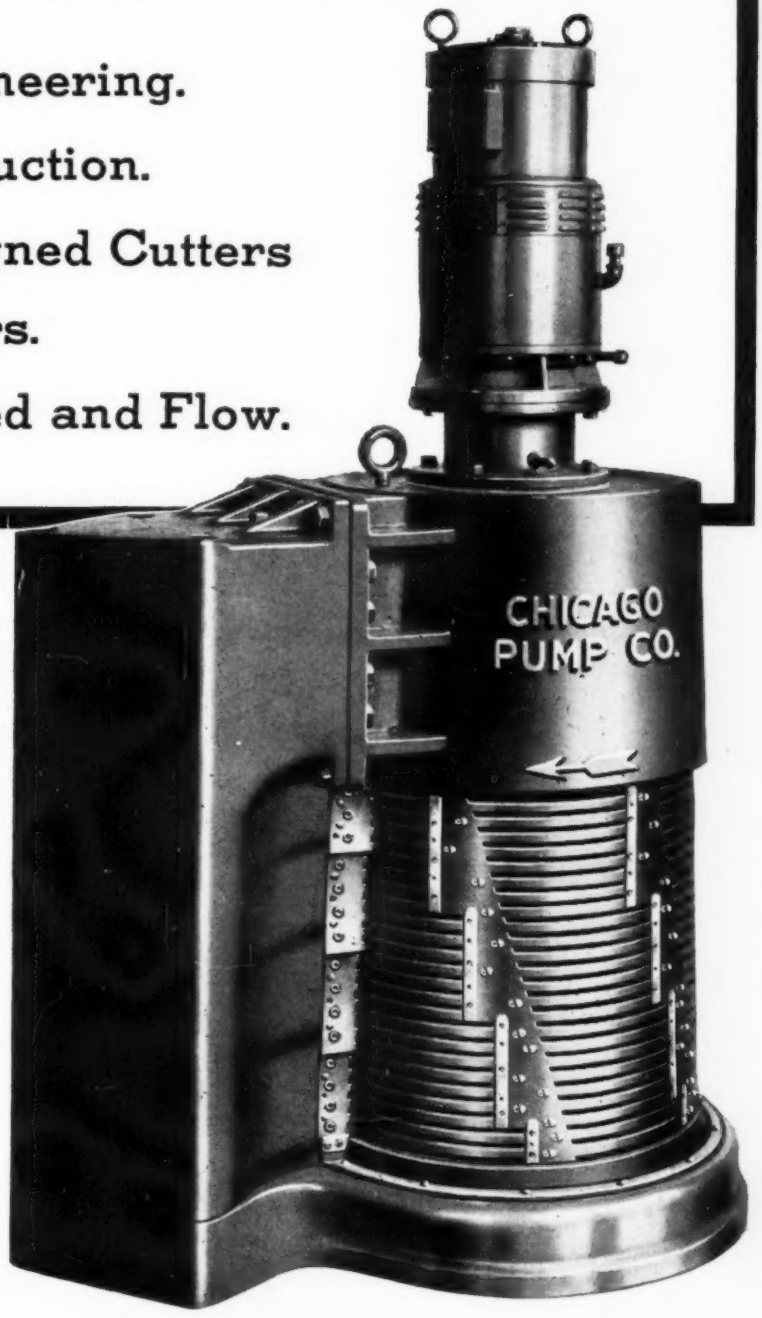
Our motto should be, "We are producing a safe water today; it shall be still better tomorrow."

[Ed. Note: From John R. Baylis, one of our valued Editorial Associates, has come this statement. To us it deserves editorial rank, and we are pleased to accord it such.—L.H.E.]

John R. Baylis

4 MUSTS OF COMMINUTION

1. Precision engineering.
2. Rugged construction.
3. Properly designed Cutters and Shear Bars.
4. Controlled Feed and Flow.



All four are found only in the Chicago Comminutor. The Chicago Pump Company developed and perfected the comminution process. The Chicago Comminutor alone meets all the requirements that 16 years' experience show are necessary for successful operation. Nearly 2500 installations prove that the Chicago Comminutor does the job.

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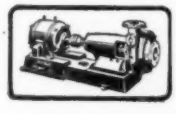

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This Truly Great **AURORA TYPE O D CENTRIFUGAL PUMP**

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For high pressure, Small capacity requirements (up to 150 G.P.M.). Wide operating range characteristics. No metal to metal contacts. Handles non-lubricating liquids without wear. Only one moving part—the Impeller.

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MEETINGS SCHEDULED

AUG. 10—RANGELEY, ME.
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Winthrop, Me.

AUG. 22-24—STATE COLLEGE, PENNA. (Nittany Lion Inn)
Pennsylvania Water Works Operators' Association. Sec'y, I. M. Glace, 1001 North Front Street, Harrisburg, Pa.

AUG. 24-26—STATE COLLEGE, PENNA. (Nittany Lion Inn)
Pennsylvania Sewage & Industrial Wastes Association. Sec'y-Treas., Bernard S. Bush, Kirby Health Center, Wilkes-Barre, Pa.

SEPT. 6-7—COOPERSTOWN, N.Y. (Otesaga Hotel)
New York Section A.W.W.A. Sec'y, R. K. Blanchard, 50 West 50th Street, New York 20, N.Y.

SEPT. 8-9—MINNEAPOLIS, MINN. (Nicollet Hotel)
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 518 Metropolitan Life Bldg., Minneapolis, Minn.

SEPT. 13-16—DIXVILLE NOTCH, N.H. (The Balsams)
New England Water Works Association. Sec'y, Joseph C. Knox, 204 Tremont Bldg., Boston 8, Mass.

SEPT. 14-16—HARRISBURG, PA. (Penn Harris Hotel)
Pennsylvania Section A.W.W.A. Sec'y, L. S. Morgan, 415 First National Bank Bldg., Greensburg, Pa.

SEPT. 20-22—DES MOINES, IOWA (Hotel Kirkwood)
Iowa Sewage Works Association. Sec'y-Treas., Leo Holtkamp, P.O. Box 310, Webster City, Iowa.

SEPT. 21—COLORADO SPRINGS, COLO. (Hotel Acacia)
Rocky Mountain Sewage Works Association. Sec'y, Carroll H. Coberly, Room 329, 1441 Welton Street, Denver 2, Colo.

SEPT. 22-23—COLORADO SPRINGS, COLO. (Acacia Hotel)
Rocky Mountain Section A.W.W.A. Sec'y, O. J. Ripple, 426 Cooper Bldg., Denver 2, Colo.

SEPT. 21-23—ATLANTA, GA. (Georgia Institute of Technology)
Georgia Water & Sewage School. Sec'y-Treas., Van P. Enloe, R.F.D. No. 5, Box 363, Atlanta, Ga.

SEPT. 21-23—WHEELING, W. VA. (Oglebay Park)
W. Virginia Industrial Wastes & Sewage Works Assn. Sec'y-Treas., R. G. McCall, Dept. of Health, Room 643, State Capitol, Charleston 5, W. Va.

SEPT. 22-23—WHEELING, W. VA. (Oglebay Park)
W. Virginia Section, A.W.W.A. Sec'y, J. B. Harrington, State Dept. of Health, Charleston 5, W. Va.

SEPT. 25-27—JOPLIN, MO. (Hotel Connor)
Missouri Section A.W.W.A. Sec'y, W. A. Kramer, State Office Bldg., Jefferson City, Mo.

SEPT. 26-28—SCHUMACHER, ONTARIO (McIntyre Arena)
The Canadian Institute on Sewage & Sanitation. Sec'y-Treas., Dr. A. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

SEPT. 28-30—TRAVERSE CITY, MICH. (Park Place Hotel)
Michigan Section A.W.W.A. Sec'y, Raymond J. Faust, State Dept. of Health, Lansing 4, Mich.

SEPT. 28-30—RAPID CITY, S.D. (Alex Johnson Hotel)
South Dakota Water and Sewage Works Conference. Sec'y, W. W. Towne, State Department of Health, Pierre, S.D.

OCT. 3-4—DALLAS, TEXAS (Adolphus Hotel)
National Association of Corrosion Engineers. (South Central Region.) G. R. Olson, Chairman, Box 1407, Shreveport 92, La.

OCT. 6-7—BURLINGTON, IOWA (Burlington Hotel)
Iowa Section A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

MEETINGS SCHEDULED

OCT. 9-12—OKLAHOMA CITY, OKLA. (Hotel Biltmore)
Southwest Section A.W.W.A. Sec'y, L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 11-13—MILWAUKEE, WIS. (Hotel Schroeder)
Wisconsin Section A.W.W.A. Sec'y, Leon A. Smith, City Hall, Madison 3, Wis.

OCT. 12—OLD TOWNE, ME.
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Winthrop, Me.

OCT. 17-19—PITTSBURGH, PA. (Hotel Wm. Penn)
Engineers' Society of Western Penna. Chairman, H. M. Olson, Wm. Penn Hotel, Pittsburgh, Pa.

OCT. 17-20—BOSTON, MASS. (Statler Hotel)
New England Sewage Works Association Sec'y, Walter E. Merrill, State Dept. of Health, 511-A State House, Boston, Mass.

OCT. 17-20—BOSTON, MASS. (Statler Hotel)
Federation of Sewage Works Associations. Executive Secretary, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.

OCT. 19-21—JACKSON, MISS. (Heidelberg Hotel)
Alabama-Mississippi Section A.W.W.A. Sec'y-Treas., J. L. Snow, 601 First National Bank Bldg., Montgomery, Ala.

OCT. 24-25—ROANOKE, VA. (Roanoke Hotel)
Virginia Section A.W.W.A. Sec'y, W. H. Shewbridge, 713 State Office Bldg., Richmond 19, Va.

OCT. 26-28—ATLANTIC CITY, N.J. (Hotel Claridge)
Pennsylvania Water Works Association. Sec'y, E. M. Hartman, Box 146, Lemoyne, Pa.

OCT. 26-28—SACRAMENTO, CALIF. (Hotel not selected)
California Section A.W.W.A. Sec'y, H. C. Medberry, San Francisco Water Department, Millbrae, Calif.

OCT. 31-NOV. 2—LEXINGTON, KY. (Hotel Phoenix)
Kentucky-Tennessee Section A.W.W.A. Sec'y, R. P. Farrell, 420 6th Ave., Nashville, Tenn.

NOV. 2-4—WASHINGTON, D.C. (Wardman Park Hotel)
Chesapeake Section A.W.W.A. (1st Annual Convention) Sec'y-Treas., C. J. Lauter, 5902 Dalecarlia Place, Washington, D.C.

NOV. 3-4—DAYTON, OHIO (Hotel not selected)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 13, Ohio.

NOV. 7-9—SOUTHERN PINES, N.C. (Highland Pines Inn)
North Carolina Section A.W.W.A. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

NOV. 11-13—YUMA, ARIZ. (San Carlos Hotel)
Arizona Section A.W.W.A. Mrs. Helen Rotthaus, State Department of Health, Phoenix, Ariz.

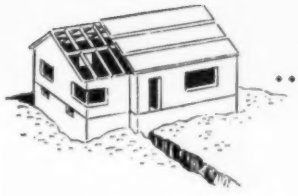
NOV. 14-16—ORLANDO, FLA. (Orange Court Hotel)
Florida Section A.W.W.A. Sec'y, A. E. Williamson, Jr., P.O. Box 1431, Daytona Beach, Fla.

NOV. 17—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston 8, Mass. (Next meeting Dec. 15th.)

NOV. 17-19—ATLANTIC CITY, N.J. (Hotel Madison)
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark, N.J.

DEC. 5-7—ALBANY, GA. (Gordon Hotel)
Southeastern Section A.W.W.A. Sec'y, T. A. Kolb, Room 433 Wade Hampton Office Bldg., Columbia, S.C.

DEC. 14—AUGUSTA, ME.
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Winthrop, Me.



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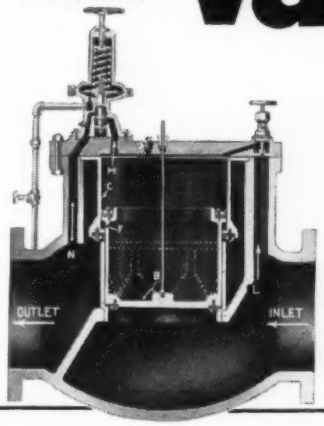
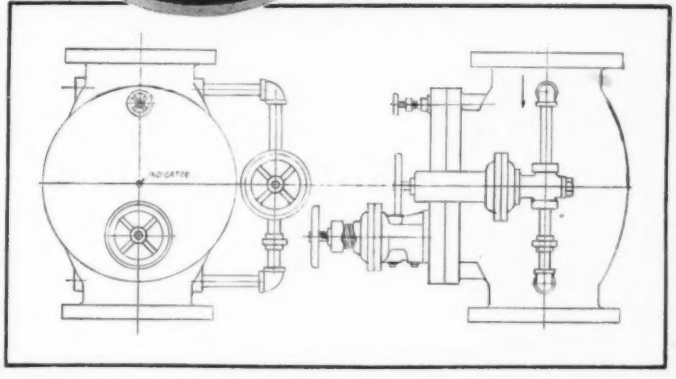


G-A Water Pressure Reducing Valve, Base Pilot Pattern. These valves are furnished in cast iron, semi-steel and cast steel. Sizes 2" and smaller generally are built with screwed instead of flanged ends.

G-A Pressure Reducing Valve arranged with a By-Passing Reducing Valve to service minimum demands, and a Reserve Main Reducing Valve for maximum demands.



G-A Water Pressure Reducing Valves maintain any desired constant delivery-downstream pressure against a higher inlet head. They also operate sensitively to avoid an excess rise of downstream pressure under any sudden varying flow condition.

Our Engineers

. . . will design and develop automatic flow control valves to solve your particular service problem. May we send you further details?

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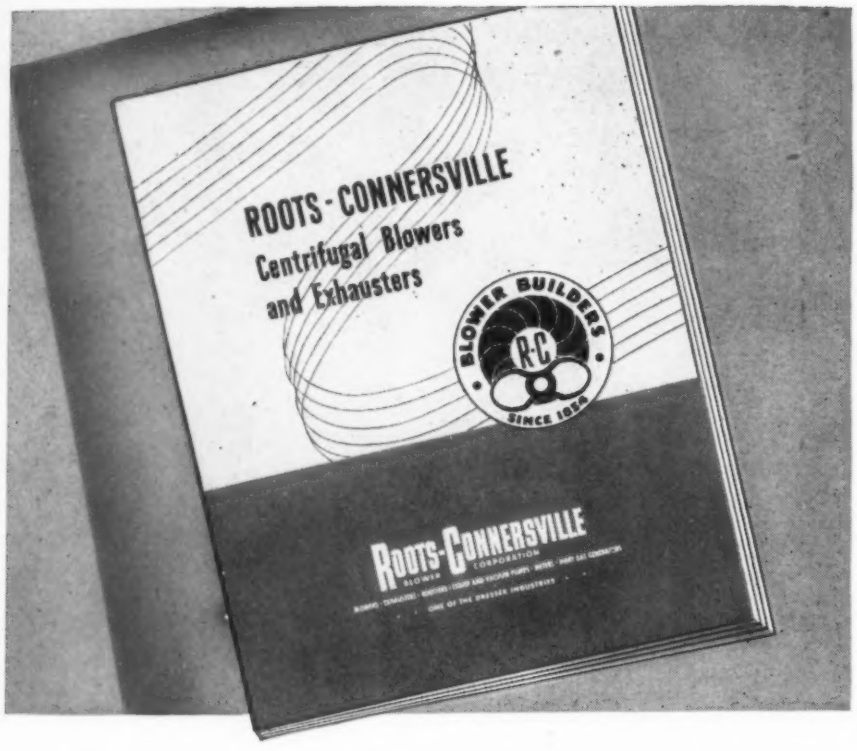

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This new bulletin gives you the latest information on Roots-Connersville Centrifugal Blowers and Exhausters. It includes characteristic performance curves; details and illustrations of R-C single-stage and multi-stage units; data on regulation and control; and other pertinent facts to help you select blowers and exhausters. Ask for Bulletin 120-B-14.

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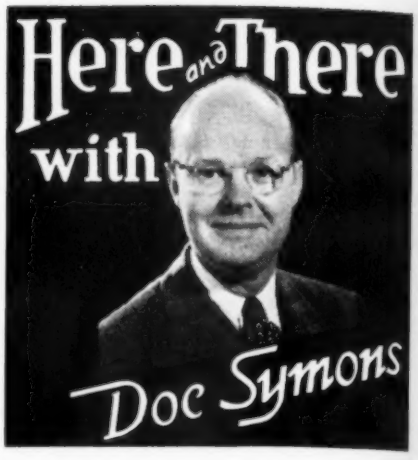


Here's **T**hat **M**an **A**gain!—And as I write this, it has been seven weeks —35 days, no less—since we had any rain hereabouts. It's so dry that my water man, W. E. (Bill) Thrasher, has told me to stop sprinkling. Next thing—something drastic.

Well, dry or not, it's time to get this column together for the August issue, and aside from the weather there is only one thing to write about —The Chicago A.W.W.A. Convention, naturally.

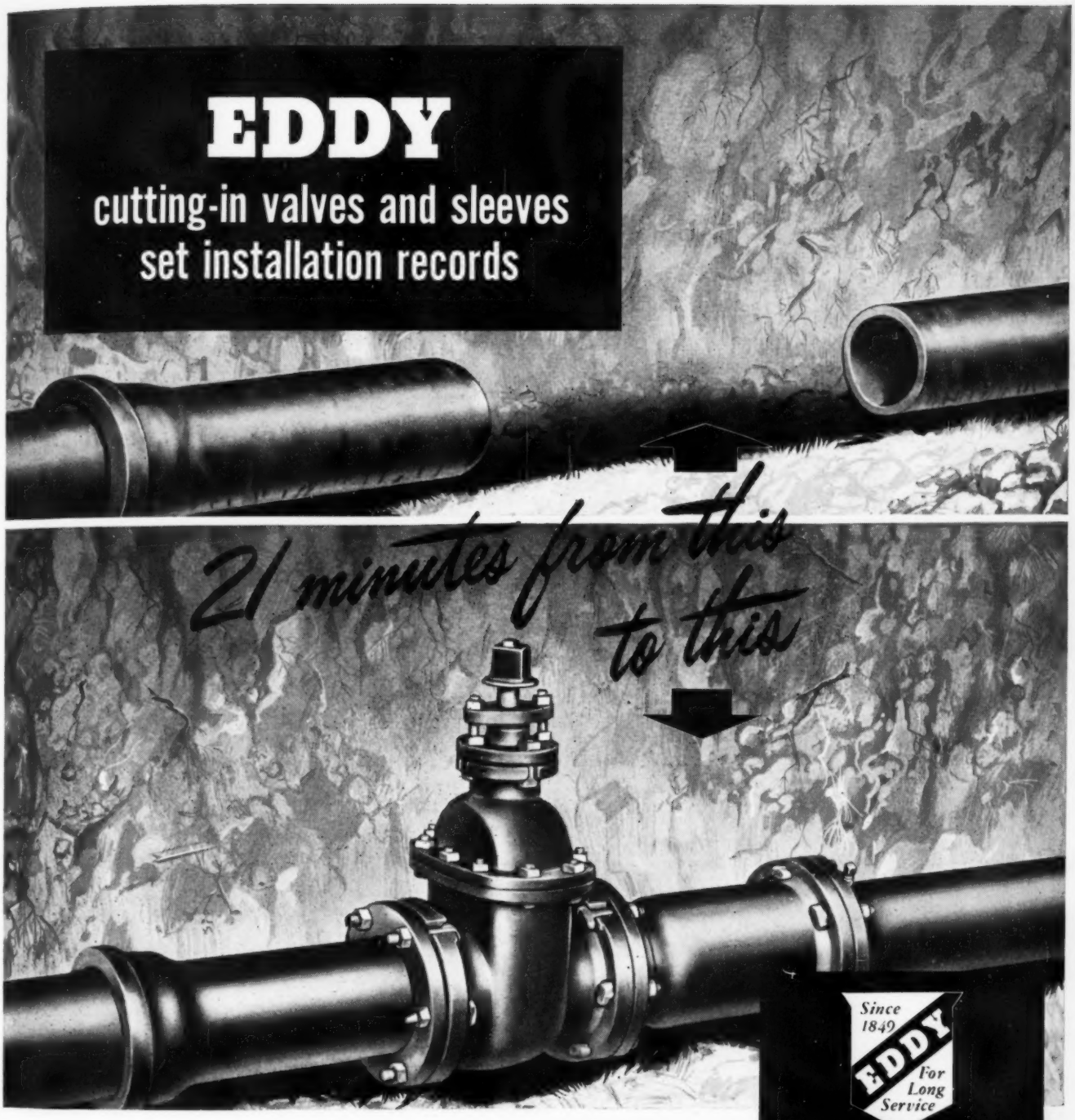
* * *

Of course, you all know that it was the biggest convention ever—and the best—but like all conventions there were a few things that went wrong. —To begin with, came the night of the dinner dance on Thursday, and I got out my summer dinner jacket, only to find that I hadn't brought a dress shirt with me.—So what could I do—I wore an ordinary shirt, and all the nice people pretended not to notice.—Those things happen, I guess.

That wasn't all that went askew that evening. After the Star Spangled Banner was played, the orchestra struck up "God Save the King" in honor of the distinguished visitors, N. F. S. Winter, President of the International Water Works Assn., and his wife. Naturally, the proper thing to do was for the audience to remain standing, but I guess a lot of persons—including some of the head tablers, I might add—thought it was "America" and sat down until the music was about half finished.—But those things happen, I guess.

Not every one was a perfect gentleman, for someone at the table next to ours shouted out to the Master of Ceremonies, "Can we sit down and eat now, or do you have any more anthems to play."—Those things happen, I guess.

Incidentally, "Joe" Wafer, Sales Mgr. of Industrial Chemical Sales,



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★ The National Board of Fire Underwriters recommend spacing valves every 500 to 800 feet on underground water distribution lines. Eddy cutting-in valves and sleeves with their mechanical joints save time . . . make the job easy and simple to perform on existing pipe lines. No caulking experts and no lead-melting equipment are needed. ★ After excavation and following removal of a section from the water main or hydrant stub, two men and a ratchet wrench can complete the job in twenty-one minutes—with all joints "bottle tight" under pressure. Work can be done in any kind of weather . . . in a flooded trench . . . fast and sure should emergency require. ★ Stock up now with Eddy cutting-in valves and sleeves and be ready for speedy, on the spot installations as circumstances may permit. Valves meet AWWA specifications . . . are available in sizes 3 to 12 inches . . . for use on both sand cast and centrifugally cast iron water pipe.

did a nice job of acting as M.C., although I didn't see his name on the dinner menu, and I don't recall that there was any announcement made as to who he was. Too bad, too, because I talked to some persons at the other end of the room, and they had no idea as to who was introducing the musical numbers.—But those things happen, I guess.

One amusing sidelight on the annual dinner was the choice of music which was played when the head tablers marched in. Somehow "Stout Hearted Men" just didn't seem to fit when fifty per cent of the head tablers were women. But maybe most of the audience didn't know what the orchestra was playing.

* * *

Linn Enslow received a beautiful pocket watch for his year's work as A.W.W.A. president, and after it was all over, I welcomed Linn back to *Water & Sewage Works*.—Doc Black made a nice speech about the seven decades of the A.W.W.A., and said he hoped he could be of service to the organization.—He will, too, brother—Harry Jordan really works his presidents, and Vic Weir is going to get a small taste of it next year, too.

* * *

In spite of the record size of the convention, the wonderful exhibits, and the excellent papers, there was something lacking.—"Bill" Orchard wasn't there.—For those who were wondering,—he came out on Sunday, but had to return home on Monday because of illness.

* * *

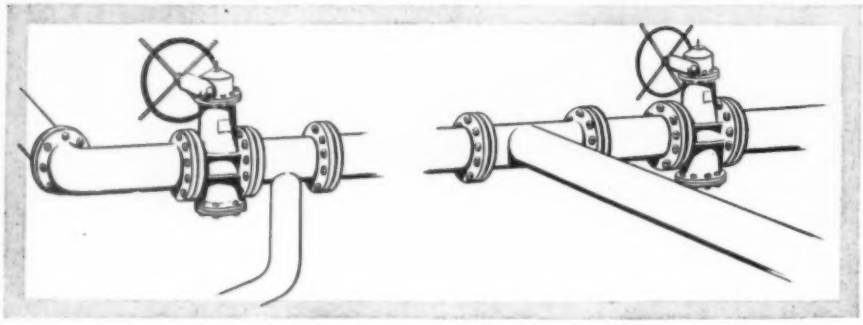
I suppose you saw a couple of fellows taking pictures with one of those new Polaroid cameras that gives you a picture in one minute. In case you wonder what kind of picture they take, you might look at this one of Mr. and Mrs. Harry Freeburn of Philadelphia Suburban Water Co.—They were celebrating their 25th wedding anniversary, as you can see by the pose.

* * *

One side of the convention most people accept without too much thought is registration. The lack of confusion with which registration was run off was undoubtedly due to the work behind the desk of Eric Johnson, and Dan Fischel (of the A.W.W.A. office) and to the members of the Illinois Section who acted as Hosts in front of the registration desk. Orchids, too, to Miss Mary Rodgers (aside to Dr. Black—she's Mr. Jordan's Secretary) who presided, with gardenia, over the information desk.—(Incidentally, the funniest story I heard at the convention was one which Miss Rodgers witnessed at the floor clerk's desk on the 14th floor.)

Yep, registration was not only the largest ever, but was the easiest. There were other reasons why the convention clicked. Few persons ever get in to see the office of the Secretary as it functions at one of these meetings. It's a very important part of a well run convention. Major domo of that office this year was Lois Schultz, who is membership secretary in the New York office of A.W.W.A.

No... Your WATER SUPPLY LINES are not actually broken this way



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The need for additional pumps in many cases is due to friction loss—leakage—obsolescence—incrustation—unrecorded take-off—increased demand—all of which cause this costly loss of carrying capacity.

Data collected by research groups over the past ten years is so accurate that, given the source of water supply and the age of the pipe, a reasonably accurate estimate of loss of carrying capacity can be made without an examination.

The Pittsburgh Pipe Cleaner Company Engineering Department has specially trained hydraulic engineers to make these estimates for you. Write Today.

And NOW—agents for the Gates Engineering Co., offering expert application of the following plastic coatings to reduce corrosion: GACO-NEOPRENE—GACO-NEOFLEX — GACO-NITRO-COTE — GACO-DURAFILM—GACO-"316."

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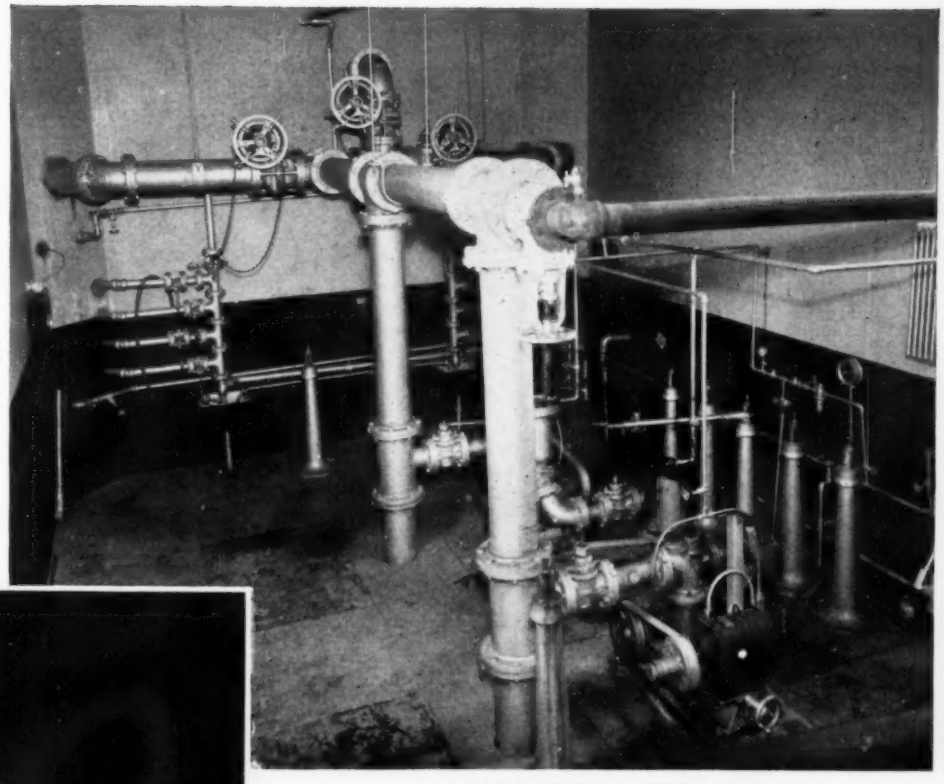
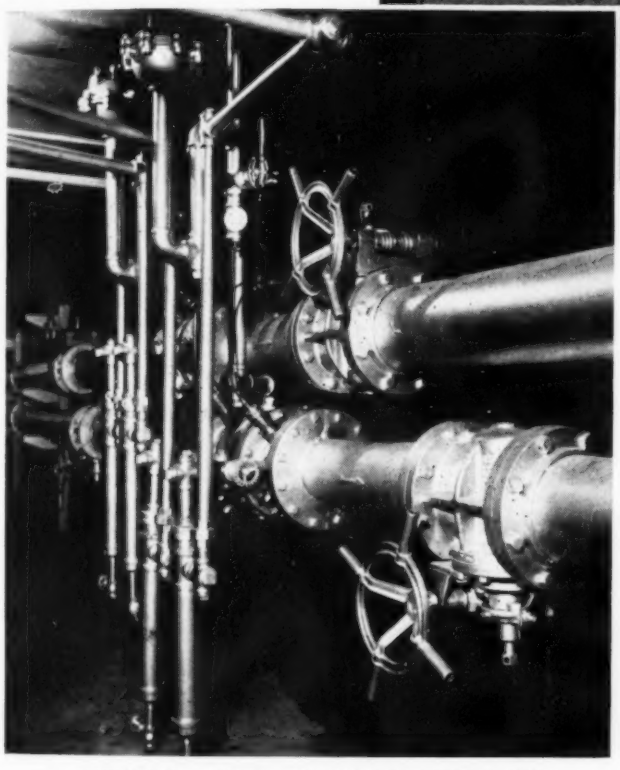
KEEP UPKEEP DOWN in sewage disposal



NORSTROM VALVES IN PUMP ROOM



NORDSTROM VALVES ON VENTURI METER LINES

The true cost of a valve is determined by its life and cost of upkeep. The inherent simplicity of a Nordstrom and the protection of its internal operating surfaces insure longest life, fewest replacements and most economical repairs when and if needed. Keep upkeep down with Nordstroms.

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"SEALDPORT" LUBRICATION
TRIPLE LUBRICANT ACTION
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QUARTER-TURN COMPLETELY CLOSES
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NO EXPOSED THREADS TO DETERIORATE

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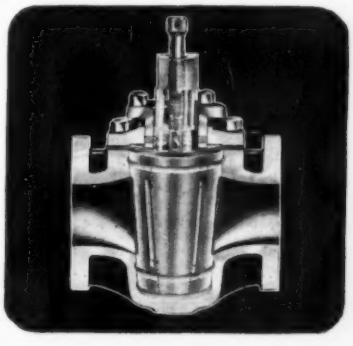


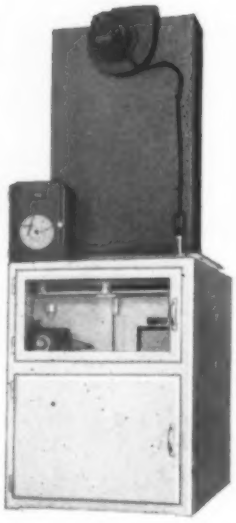
Among my souvenirs of the convention is a business card of Dr. J. R. Hurtado, Director of the Water Laboratories, of the National Institute of Sanitary Engineering, Caracas, Venezuela. On the back of the card is written, "Te amo, eso es mentira—Blanca". There's a couple of nice kids. He calls here "Mono," and she calls him "Mona," both of which I understand mean "Monkey."

* * *

I was mighty pleased and flattered to find that "Bill" (Newark Water) Banks, "Andy" (Pittsburgh Pipe Cleaner) Anderson, Henry (Proportioneers) Munroe, and several others of my readers made use of my May column to help them pick places to eat. —If you didn't get to any of those places that I mentioned, perhaps you went up to Matt Shulein's for a dinner and saw him do some of his famous card tricks. Or maybe you had a steak at Barney's Steak House or at the London Chop House. Perhaps you had luncheon at Wrigley's or at the Buttery across from the Ambassador East.—And if you searched out the unusual maybe you dropped into Ricardo's which was featured in the Ralph (Truth or Consequences) story in *Life* in early June. If you like the bizarre in paintings you can see a couple by the Albright brothers, there behind the bar.

* * *

If you didn't get to the convention, or for some reason, missed the exhibits, maybe you'd like to know what you missed. So here is a quick tour—We begin with the Well and Old Oaken Bucket, with none other than Arthur (Where'd you get that hat?) T. Clark of W.S.W.M.A. posing with C. J. Thannhausen, Convention Mgr. for the Hotel Stevens.



AT GRAND RAPIDS, MICH., the first city-wide tooth decay control project in America employs the OMEGA Loss-in-Weight Gravimetric Feeder to add sodium flouride to the city's water supply. Sponsors of this pioneer undertaking selected the Omega Feeder for its time-tested reliability and its extremely high accuracy. With positive rate adjustments, this feeder provides the close control of feeding needed to maintain correct flouride concentration for optimum tooth decay control.

The Loss-in-Weight Gravimetric Feeder, by feeding to an accuracy of 99% or better, performs a wide range of chemical treating and feeding operations in water works and sewage plants throughout the country. With the Omega Dust Collector, chemical feeding is dust-free as well as trouble-free — the perfect combination for modern plant operation. Descriptive bulletin on request.

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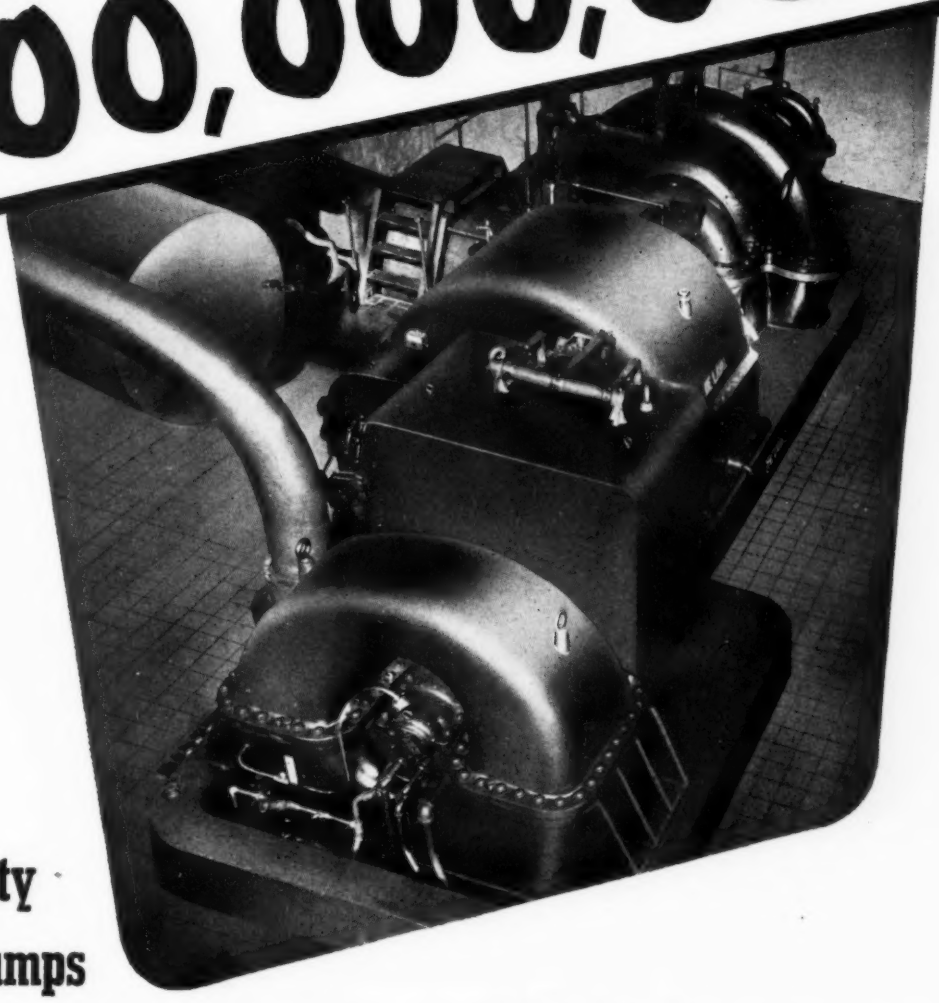
(Division of Builders Iron Foundry)
PROVIDENCE 1, R. I.

Proceeding around the Hall, you might have seen this pair (Peggy Wood and Gloria Hunter) taking threshold tests at the Nuchar Booth.

Or mayhap you would have stopped at the Koppers' Booth, as did this fellow, to play the slot machine there.

1,300,000,000



Total Capacity of De Laval Pumps in the City of Chicago . . . 1,300,000,000 Gallons Daily

In the year 1920, the City of Chicago installed its first turbine-driven centrifugal pump — a unit of 60 mgd capacity in the Central Park Station. The performance, trouble-free operation, economy and flexibility of this unit proved to be so satisfactory that additional De Laval turbine-driven pumps were installed in rapid succession.

Today, the City of Chicago is served by a total of 16 De Laval turbine-driven pumps and 5 De Laval motor-driven pumps having a total capacity of one billion, three hundred million gallons daily.

SEND FOR CATALOG 10-7-WS

DE LAVAL DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

WW7

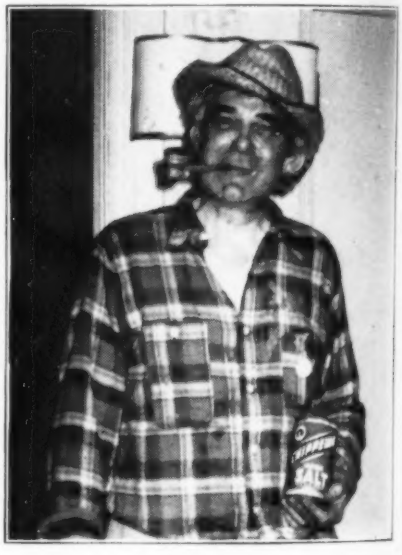
If so you would have obtained the slugs from this young lady.

And this trio, which paused for refreshments after a strenuous Do-Ce-Do.

Reading from right to left, Host Carl (U.S. Pipe) Brown, Mrs. Lois (A. W. W. A. Membership Secy.) Schultz, and Very Truly Yours, H.T.M.A.

Of course the Florida Section of A.W.W.A. had its own exhibit where it was possible to quench your thirst with orange juice, as is evident from this picture of Florida's Finest.

Then there were the exhibits on the night of the Hayseed Hulabaloo, among which was this "character", better known as Ed (Chicago Bridge) Alt.



* * *

One manufacturer had a beautiful room on the 20 something floor, but to reach it, one had to walk down a corridor past another entertainment room. As I passed that way one evening, a couple was asking the man in the door, "Is this the—&—room"? To which the reply was, "No it isn't, —But I'm sure it doesn't make any difference."

* * *

Everyone seemed to be having a good time; the ladies were particularly well pleased with a tea at the famous Marine Grill of the Edgewater Beach Hotel, a fashion show at Marshall Field's, a bridge party, and radio parties.

In considering replacement vs. reconditioning of a 53 year old line carrying Water to Chula Vista and National City, Calif., the California Water and Telephone Company decided to recondition the line since replacement in addition to the tremendous cost would have meant disturbing many acres of valuable citrus and vegetable fields.

Reconditioning involved a thorough cleaning by National of over 15,000 feet of 24 inch line, after which the entire line was centrilined.

According to information received, the reconditioning has added at least 20 years more of useful life with a marked increase in the volume of water previously handled.

Our engineers will gladly submit facts and figures on how National has solved similar problems for other utilities. Why not write today?

NATIONAL WATER MAIN CLEANING CO., 50 Church St., N. Y. 7, N. Y.

ATLANTA, 333 Candler Building, 1221 Mortgage Guarantee Building • BOSTON, 115 Peterboro Street • CHICAGO, Room 1336, 122 So. Michigan Avenue • FLANDREAU, S. D., 315 No. Crescent Street • KANSAS CITY, 422 B.M.A. Building • LITTLE FALLS, N. J., Box 91 • LOS ANGELES, 448 South Hill Street • OMAHA, 3812 Castellar Street • RICHMOND, 210 East Franklin Street • SALT LAKE CITY, 149-151 W. Second South Street • SAN FRANCISCO, 681 Market Street • SIGNAL MOUNTAIN, TENN., 204 Slayton Street • WACO, P. O. Box 887 • MONTREAL, 2028 Union Avenue • WINNIPEG, 576 Wall Street • HAVANA • MAYAGUEZ, PUERTO RICO • BOGATA • CARACAS • MEXICO CITY

For abrasive ladings a.c.f. Lubricated Plug Valves with clear full circular ports* are ideal. Compact size is retained only through cylindrical plug design...straight-through flow with same shape and cross section as the pipe. Quick quarter turn to open or close...no exposed seats. For every reason a.c.f. Valves should be your first choice.

*Also offered with full area rectangular ports.

a.c.f. CYLINDRICAL FULL PIPE AREA LUBRICATED **PLUG VALVES**

Representatives in more than 50 principal cities.

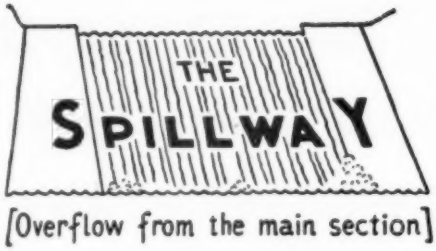
Ideal for sewage operations. Ask for catalog 4-WS. American Car & Foundry Co., Valve Division, 30 Church St., New York 8.

Room hopping was popular in the evenings, especially after the scheduled evening affairs.—One of the gags of the convention worked like this: A manufacturer's representative would say to a customer, "Come up to our room tonight to see our *Exhibit.*" The "exhibit" turned out to be a beautiful view of the famed Buckingham Fountain and the lake front.

* * *

That'll be all for a spell.—See you next month with the rest of the story.

V.T.Y.—Doc.



E. T. Roetman Goes to Southwest with U.S.P.H.S.

Announcement has been made that E. T. Roetman, Sanitary Engineer of the American Viscose Corp., Philadelphia, Pa., has resigned his position to become Asst. Basin Engineer in the U.S.P.H.S. Stream Pollution Control Division, at Dallas, Texas. Mr. Roetman will be located in the Western Gulf drainage basin and the Colorado drainage basin office.

Prior to his association with the American Viscose Co., Mr. Roetman held positions in the Bureau of Industrial Hygiene of the West Va. State Health Dept. He was also Chief Engr., Tygert Valley Homesteads, Elkins, W. Va.; and Research Fellow at West Virginia University.

In the past several years, Mr. Roetman has been active in the field of industrial waste treatment problems, particularly rayon wastes, about which he has written articles for this magazine.

Mr. Roetman has made this change of positions and locations in the country on the advice of his physician.

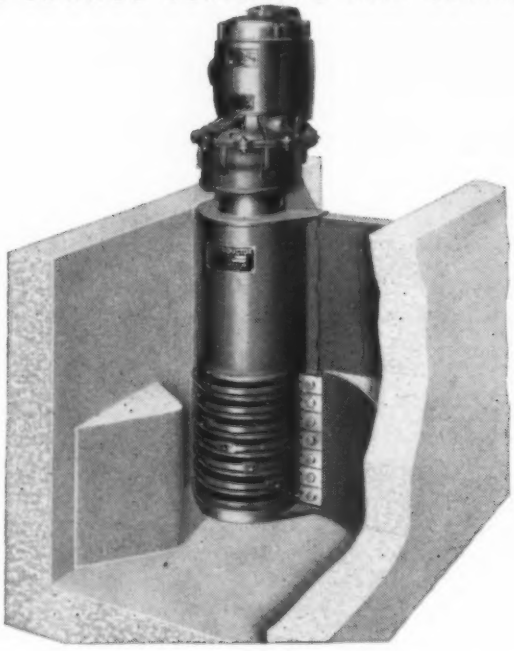
Annual Report Buffalo, N. Y. Sewer Authority

Buffalo (N.Y.) Sewer Authority. 1947-48 (87 pages). F. W. Crane, Gen. Mgr. Collection of sewer rents was 95.8 per cent. Costs of Operation were $1,681,934.80, including debt service. Actual operation expenses were $951,938.40, an increase over the previous year of $72,347.86, mostly for increased salaries and wages. Cost of treatment works operation was $551,728.93 or $10.97 per mil. gal. Pumping costs for sewage were $1.87 per mil. gal.

Average flow of sewage 137 mgd., Susp. Solids—206 ppm., B.O.D.—139 ppm., Chlor. Demand—4.3 ppm. Bacterial kill—98.4 per cent. Raw sludge loading on digesters—62,800 lb. per day. Dig. Tank loading—0.083 lb. per cu. ft. per day; gas produced—400,700 cu. ft. per day. Sludge conditioned—42,000 lb. per day, 10.66 per cent lime and 3.05 per cent Fe Cl_3. Sludge burned 45,000 lb. per day; Ash 14,700 lb. per day. Population tributary—Approx. 600,000. Laboratory tests totalled 40,352 on 6440 samples.

GRIDUCTOR®

STRAIGHT CHANNEL SEWAGE SCREENING AND CUTTING



SEND FOR..

Your copy of Bulletin No. 5100.. an eight-page illustrated folder describing the GRIDUCTOR in complete detail with drawings, and charts of operation, parts, installation and capacities.

A *BETTER* Way to *Reduce Solids!*

GRIDUCTOR *Intercepts* and *Reduces* the larger solids in a normal sewage stream. Interception is by screen or grid action .. reduction by intermittant cutting without excessively increasing the dissolved organic content of the sewage. Other superior advantages are; 1. Easy *straight channel* installation, 2. Protection against fouling and clogging of treatment plant units, 3. Solids settle more readily in primary clarifier, 4. More gas production, 5. Coarse and fine screening actions are combined with cutting and shearing, 6. Little loss of head whether cutters are idle or operating, 7. Low operating cost, 8. Long life.

GRIDUCTORS are giving highly satisfactory service from coast-to-coast. A firm of well known designing engineers writes .. "He is obtaining excellent service from the Infilco Griductor. Hospital sewage presents a far more difficult problem because bandages, wrappings and larger quantities of all sorts of garbage are treated!" Get complete information now. Call or write our nearest field engineer or send for our Bulletin No. 5100.

INFILCO

• BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 •

INFILCO INC.

GENERAL OFFICES: 325 WEST 25th PLACE • CHICAGO 16, ILLINOIS

SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

CONCRETE PIPE
...unexcelled for water lines

FROM whatever standpoint you examine the qualities of concrete pipe for water lines—cost, efficiency, maintenance expense or length of service—concrete pipe is the best buy. Here's why:

1. It can be designed for all pressures used in American water works practice
2. Its joints can be made watertight easily and economically
3. It maintains high hydraulic efficiency; there is no tuberculation and far less incrustation
4. It minimizes taste, odor and dirty water difficulties
5. It has the strength to sustain heavy overburdens

These advantages were obtained in a new water supply line in Provo, Utah, shown above, where more than 3¼ miles of 48" concrete pipe were used. The Utah-Idaho Concrete Pipe Company of Salt Lake City was the contractor.

Whether you are planning a water line like the Provo project or a small community or industrial job, it pays to examine all the advantages of concrete pipe. Its first cost is moderate, its upkeep is little or nothing and it has extra long life.

Taken together these three important factors give you *low-annual-cost* service. That is the true measure of economy in water line operation.

AMERICAN CONCRETE PIPE ASSOCIATION
228 NORTH LA SALLE STREET, CHICAGO 1, ILLINOIS

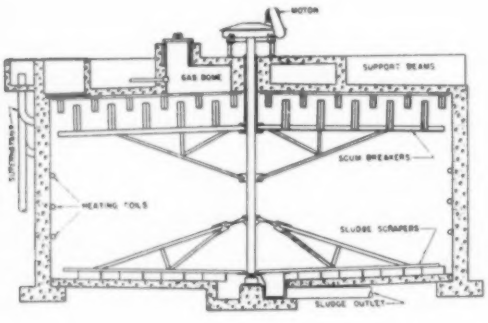
How to Know When it Needs Oiling*

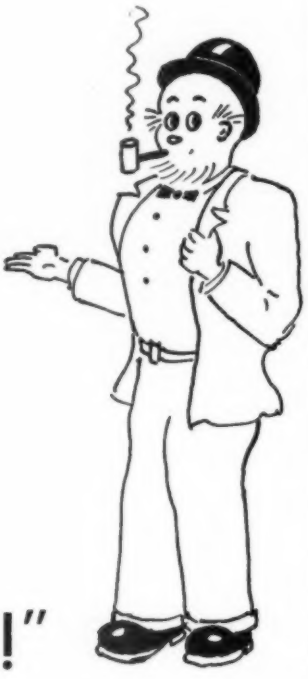
Don't ever allow oiled equipment to operate until it is without oil. If it is a fan, electric motor, water motor, engine, lawn mower, vacuum cleaner, or anything of the sort, it needs oil. Don't let it get "dry."

The simplest way in which to determine whether or not equipment needs oiling is to note whether or not it stops abruptly as soon as the power is turned off. If it stops abruptly, it certainly needs oil. If it runs along normally and easily, coming to a halt gradually, as it should, its condition is safe. The friction is not excessive. Take for example, an ordinary electric fan. If the fan is properly oiled it will run along for some time after the switch is turned, due to its own momentum. If it is not properly oiled it will stop quickly. The drier it is, the quicker is the stop.

To be sure it is best always to keep equipment so well oiled that there will never be any sudden stopping. This method is a positive "tell tale" which definitely tells you that it needs oiling before it is so void of oil that it may become ruined. Equipment that is not properly oiled at all times is likely to prove short-lived and expensive.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.





"That's the digester for me!"

"Shure, 'n me Hardinge Digester keeps me scum from pilin' up and gives me uniform gas perduction.

"An' with its rotatin' mechanism fer scrapin' and scum breakin' ye kin even use a flat bottom tank, 'n still git a dense digested sludge.

"Take it from an old sewage plant operator, if ye got digester worries, jist write Hardinge. Ask 'em fer Bulletin 35-C-15."

HARDINGE
COMPANY INCORPORATED
YORK, PENNSYLVANIA—240 Arch St. • Main Office and Works
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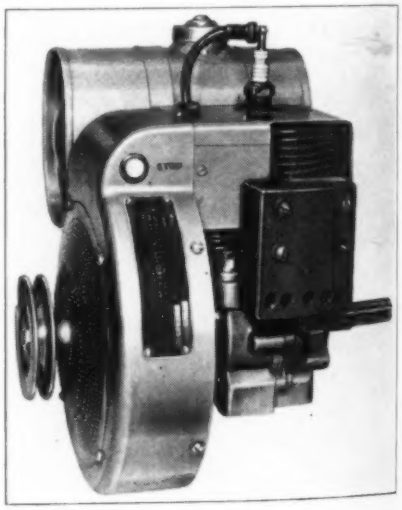
SAN FRANCISCO 11—24 California St. • 200 Bay St.—TORONTO 1

MANUFACTURERS' and EQUIPMENT NEWS

800

Light Weight Gas Engine

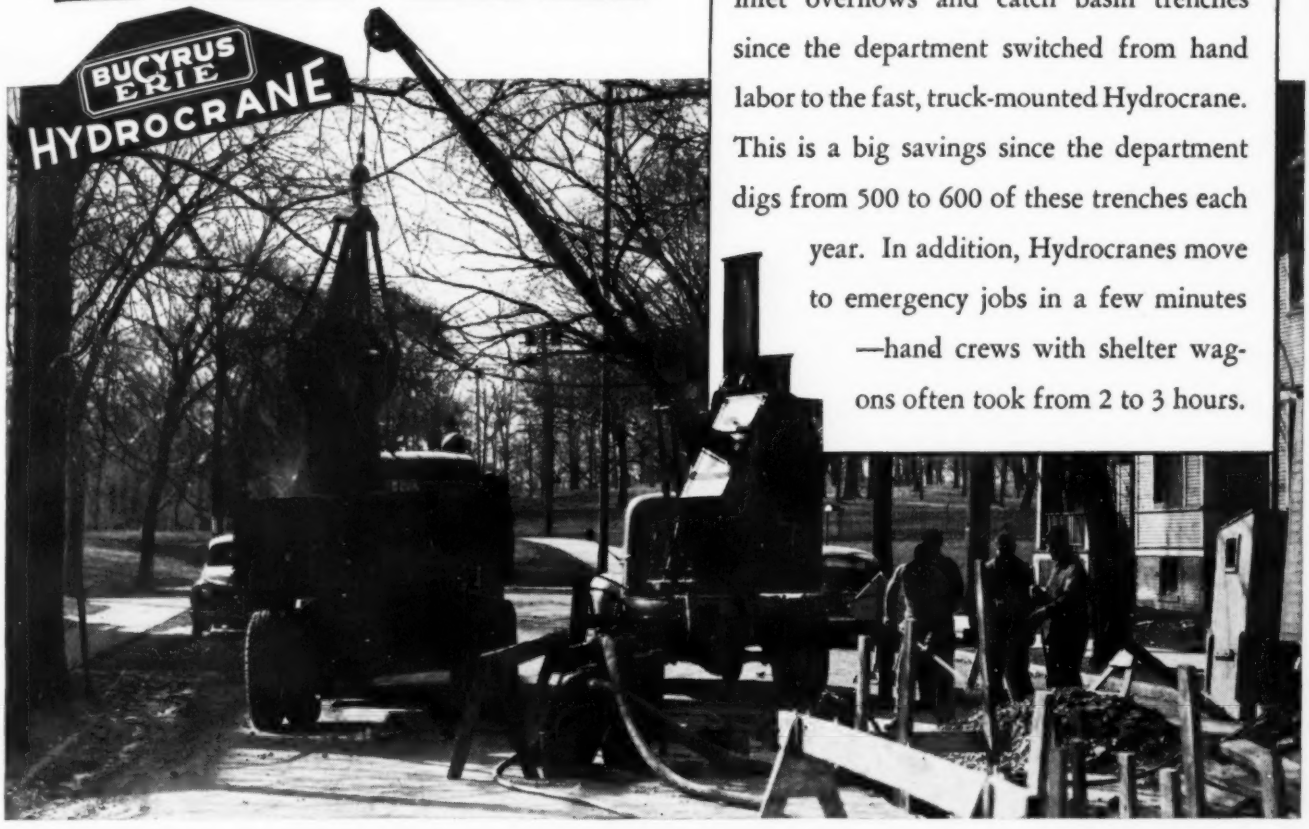
Homelite Corp., Port Chester, N. Y., has announced a new air-cooled 4 hp. gasoline engine, weighing only 19 lb. complete. The new No. 20 Homelite Engine uses aluminum alloys for all major castings. It is of 2-cycle design, which permits a minimum number of moving parts, simplifying maintenance and repair work. This unit is designed for any industrial application where light weight and compact size are important. The engine can be used either horizontally or vertically. It develops 4 hp. at 4,000 rpm. and 3 hp. at 3,000 rpm.



To obtain further information on this new light weight gasoline engine, use the Reader Service Card on which is entered the above key number and your name and address.

Milwaukee Sewer Department Cuts Trenching Costs 30%

Milwaukee Sewer Department records show a reduction of 30% in cost of digging storm inlet overflows and catch basin trenches since the department switched from hand labor to the fast, truck-mounted Hydrocrane. This is a big savings since the department digs from 500 to 600 of these trenches each year. In addition, Hydrocranes move to emergency jobs in a few minutes —hand crews with shelter wagons often took from 2 to 3 hours.



The Bucyrus-Erie Hydrocrane handles many jobs no other crane can touch — travels up to 50 m.p.h. on the open road . . . works in close quarters . . . simple to operate, hand levers only . . . precision control for close work. Two models — 1/4 yd. 2-ton H-2 and 3/8 yd. 3-ton H-3. Send for complete information today.

Equipped with a special hydraulic catch basin bucket, this Hydrocrane makes quick work of cleaning clogged catch basins.

Here are some of the jobs handled by the fully hydraulic Hydrocrane:

With a hydraulic bucket it . . .

Digs storm inlet overflows and catch basin trenches.
Digs lengths of trenches for sewers that have broken down.
Loads dirt into trailers.
Back-fills crushed stone around pipe.
Handles clean-up work.

With a hook and chain it . . .

Sets sewer pipe.
Places valve and pipe fittings on water mains.

BUCYRUS ERIE

HYDROCRANE DIVISION SOUTH MILWAUKEE, WIS.

37H49

BUCYRUS-ERIE HYDROCRANE DIVISION, South Milwaukee, Wisconsin

Gentlemen: I want the full story on the Hydrocrane.

Name.....

Dept. or Company.....

Address.....

City.....(.....) State.....

801

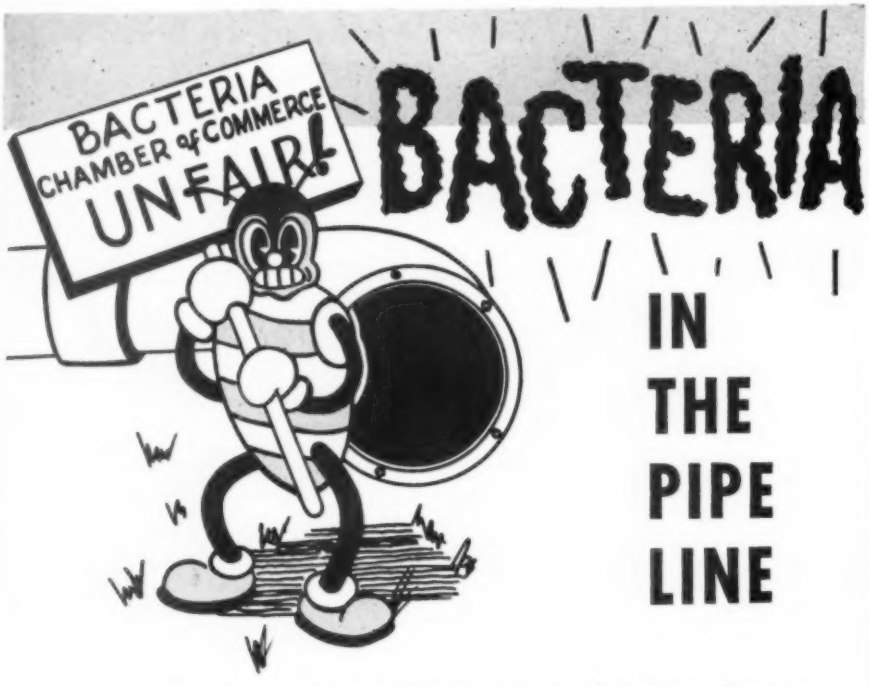
"Watersphere" Re-designed

Conveniences Added and Eye-Appeal Improved

The Chicago Bridge & Iron Co., Chicago, Ill., has completely re-designed the "Watersphere," a modern elevated tank of welded construction, which consists of a spherical tank supported on a single, cylindrical column. Previously, the column was supported on a cone shaped base, but the new design supporting column has a graceful curved shape from top to bottom.

The Watersphere in its new design is available in standard sizes from 25,000 to 100,000 gal. capacity in heights of 50, 75, 100 and 125 ft. to bottom. Special designs will be made for special heights or tanks of larger capacity.

An illuminating 4-page folder, describing the newly designed Watersphere, has just been issued. Copies will be sent those designating the above key number on one of the Reader Service Cards found in this issue.



Can the action of sulfur bacteria *(Thiobacillus thiooxidans)* on sulfur be prevented by the use of a bactericide in a sulfur jointing compound?

The answer, by qualified authorities, is YES!

Atlas research made use of this information. *Tegul*-MINERALEAD has contained a bactericide for more than two years.

Tegul-MINERALEAD

MORE THAN EVER *SUPERIOR*
For Jointing Bell and Spigot Pipe

THE *Atlas Mineral* *Products Company of Penna.*

MERTZTOWN, PENNA.

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*KANSAS CITY, MO. — SAN FRANCISCO, CALIF.
*LOS ANGELES, CALIF. — *SEATTLE, WASH.
NEW ORLEANS, LA. — TUPELO, MISS.

*Stock carried at these points

IN CANADA: H. L. BLACHFORD, Limited, MONTREAL AND TORONTO

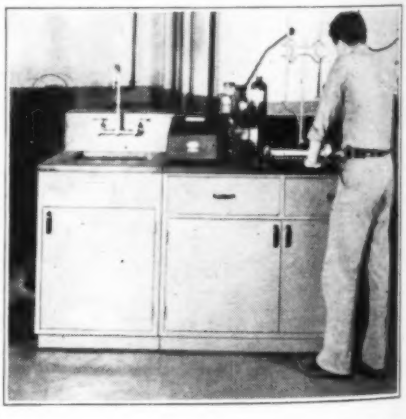
Homelite Opens Pittsburgh Office

Homelite Corp., Port Chester, N. Y., has announced the opening of a new branch office in Pittsburgh, to cover Western Pennsylvania, West Virginia, and Eastern Ohio. William (Bud) Livingston will be in charge of the new office, located at 810 Ridge Avenue, Pittsburgh 12, Pa. The new Pittsburgh office will carry a complete stock of Homelite material—Carryable Pumps, Generators, Blowers, Chain Saws, Paving Breakers, Floodlights, etc.

802

Test Benches

Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa., has announced the development and production of new Test Benches, for use at test stations in water and sewage works and industrial waste treatment plants. These can now be had in any length and in a variety of



designs by joining prefabricated steel units recently developed and now available from stock.

Eighteen different all-steel units are available, including drawers, cupboards, sinks, tables, storage cases, and so forth. These may be easily joined together to form test benches either 30 in. or 36 in. high. Units are two, three, four or five feet in length and make use of the newly developed plastic-impregnated stone called "Kemrock" for bench

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE.—P. O. BOX 14, MEMPHIS 1, TENNESSEE

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Complete Service for Elevated Water Tanks—

30 Years Experience

BE SAFE DON'T GAMBLE!

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress.

On completely re-conditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

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THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

working surfaces. The new line is called "Unitized" test benches.

To obtain further information about these units, use a Reader Service Card on which is entered the above key number and your name and address.

"The Great Gildersleeve" to Appear in Rockwell Ads

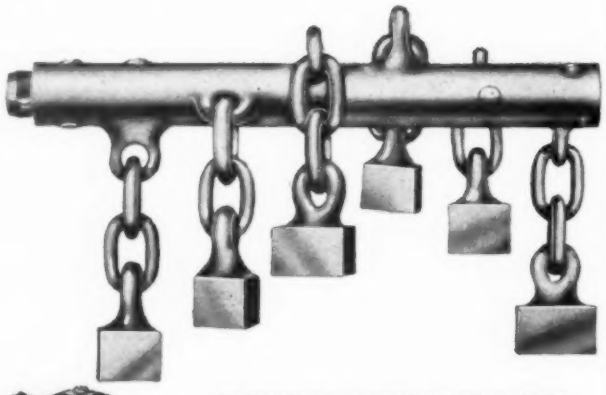
Starting with the August issues of the trade magazines, Pittsburgh Equitable Meter Division, Rockwell Manufacturing Company, will present a continuing series of unique pictorial advertisements starring Harold Peary, "The Great Gildersleeve." Throckmorton P. Gildersleeve is probably America's best known Water Commissioner. He is heard on the air over NBC.

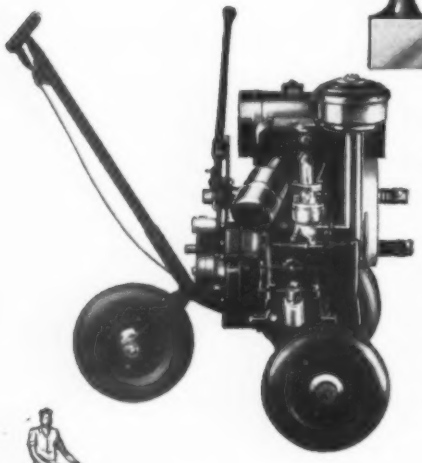
The theme of the Gildersleeve series of Rockwell ads embraces a revolutionary plan for improving "public relations" in the Summerfield Water Department. To this end "Gildy" is assisted by the movie comedian, Chester Conklin, and a bevy of Hollywood beauties.

The presentation of "Gildy" by Rockwell is through the courtesy of Kraft Foods Co., his sponsor.

PRACTICAL PIPE LINE CLEANING TOOLS FOR PRACTICAL MEN

"Flexible" Power Tools for Cleaning Pipe in Short Sections—in Diameters Ranging from 4 Inches to 12 Inches.





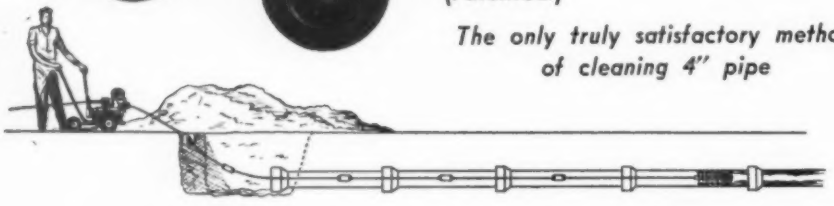
"FLEXIBLE" CHAIN HEAD AUGER

Cleans right down to the metal. Has never been known to break a pipe or damage a corporation cock. (Patented.)

"FLEXIBLE" POWER DRIVE

Powerful, portable power drive unit. Simple, safe to handle. Furnished with dependable 4 H.P., plus engine. (Patented.)

The only truly satisfactory method of cleaning 4" pipe



"FLEXIBLE" EQUIPMENT NOW FOR SALE, LEASE OR CONTRACT.

Write the nearest office today for full particulars.

FLEXIBLE UNDERGROUND PIPE CLEANING CO.

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P. O. Box 447 Lancaster, Texas
P. O. Box 165 Atlanta
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29 Cordan Ave. Roslindale 31, Mass.
147 Hillside Ter. Irvington, N. J.
3786 Durango Ave. Los Angeles 34, Calif.
801 E. Excelsoir Blvd. Hopkins, Minn.
401 Broadway New York 13
41 Greenway St. Hamden, Conn.
2011 Central Ave. Memphis, Tenn.
4455 S.E. 24th Ave. Portland 2, Ore.

G.A. Fleet Heads American Well Works N.Y. Office

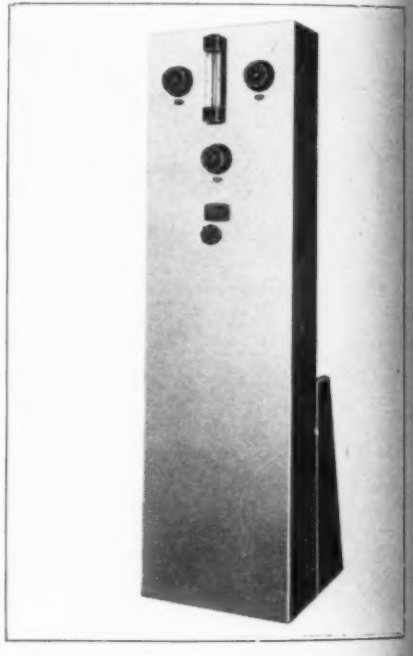
Gerald A. Fleet has been appointed District Manager in the New York office of the American Well Works, of Aurora, Ill. He will serve the New York District, including the metropolitan area, New Jersey, and southeastern New York State. His headquarters will be located at 475 Fifth Ave., New York City.

Mr. Fleet holds an MCE degree from New York University and has been on the staff of the New York State Health Dept. During the war he was a Major in the Sanitary Corps.

803

New Chlorinizer Model

Builders Providence, Inc., Division of Builders Iron Foundry, Providence 1, R. I., has announced a new "Chlorinizer," Volumetric Model DVS. This model, shown in the accompanying photograph, is designed



to accurately meter chlorine gas and to produce delivery of chlorine water solution to the point of application.

The Model DVS "Chlorinizer" is equipped with automatic safety devices and has many other features which include positive and accurate Sightflo chlorine rate indicator, wide range metering without changing orifices or scales, durable and low maintenance control valve, individually sealed gauges, elimination of tray-produced chlorine odors, visible and positive evidence of effective vacuum, flow of chlorine positively

(*Continued on p.* 95A)

READER SERVICE CARDS for

WATER & SEWAGE WORKS

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JUST
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THESE
CARDS
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AND
MAIL —
TO
RECEIVE
THE
LATEST
INFORMATION
OR
LITERATURE
DESCRIBED
IN
THIS
ISSUE

Place Stamp Here

WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Reader Service

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WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Write key number of item you desire here →

Your name .....

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Company or Dept. .....

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WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

shut off by powerful spring-loaded valve, and no requirement of hot water or bell jar heaters.

To obtain further information on this new model, mail a Reader Service Card on which is entered the above key number, and your name and address.

C. C. Roden Joins Builders-Pacific Inc.

Announcement has been made that Carl C. Roden has been added to the personnel of the Builders-Pacific, Inc., as sales engineer in the Berkeley office. Mr. Roden will specialize

in Builders Providence, Omega and Proportioneers' products.

A graduate of M.I.T. in 1944, with a B.S. in Mechanical and Industrial Engineering, Mr. Roden served in the Navy as a Lieutenant jg. from 1943-46. Following the war, he was employed by the Ford Motor Co., and thereafter entered Stanford University as a graduate student in the College of Business Administration and secured his M.B.A. Degree in April, 1949.

Mr. Roden will be associated with Lee H. Chamberlain, President of Builders-Pacific, Inc.

Neptune Moves Chicago Office

Neptune Meter Co. has announced the removal of its Chicago office to a modern building at 4048 W. Taylor St., Chicago 24, Ill. This move was necessitated in order to enlarge laboratory and service facilities and to provide space for the newly acquired Rensselaer Valve Co. Division.

For Industrial And Municipal Water Treatment Plants

Alhydro FLOC PRODUCER

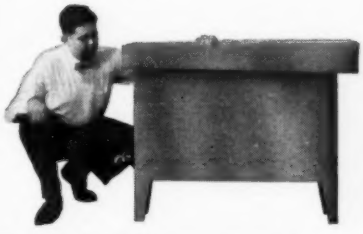
produces FLOC electrolytically

. . . . REDUCES CHEMICAL STORAGE PROBLEMS SAVES MONEY ON FREIGHT AND HANDLING COSTS

Check

THESE ADVANTAGES . . .

- Easily controlled production of completely stable floc regardless of water temperature, clarity or pH over a wide range.
- Better water at competitive costs.
- Usually eliminates need for correcting water before or after treatment.
- Simplicity of operation.



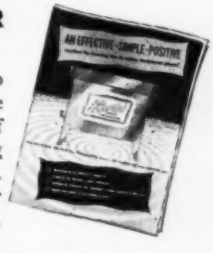
ONLY SO BIG... ***yet one unit treats an average of 300,000 gals. per day*** **. . . and Alhydro may be installed in single or multiple units in existing or proposed water treatment plants.**

Low-voltage d.c. current and aluminum plates are the only materials required to operate the Alhydro Floc Producer in practically every case. The Alhydro unit relieves you of paying freight and providing storage for bulky chemicals . . . completely eliminates the need for chemical feeders.

Maintenance costs fade, too, because only a minimum of attention and maintenance are needed for the production of concentrated aluminum hydroxide floc. Floc concentration may be controlled by varying current volume.

• WRITE FOR FOLDER . . .

See how Alhydro can simplify the treatment of water for drinking or industrial use. Write for your free copy today.



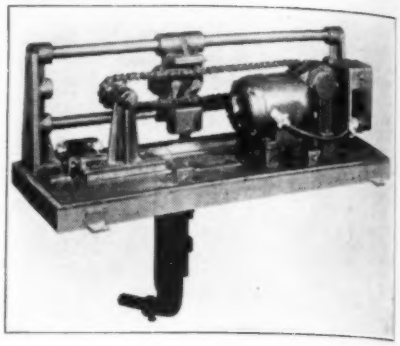
ALHYDRO, INC. DEPARTMENT 8B
516 N. CHARLES ST., BALTIMORE 1, MD.

National Technical Lab Establishes New York Department

National Technical Laboratories, manufacturers of Beckman Instruments, has recently established a New York Service Dept., located at 1114 First Ave., New York City. The new department, staffed with factory-trained technicians, is equipped with all necessary parts to test instruments and for completely servicing all types of Beckmen Instruments and accessory equipment.

804

Automatic Sampler



Hardinge Co., Inc., York, Pa., has secured manufacturing and sales right to an accurate and rugged sampler. The device is being placed on the market as the Hardinge Automatic Sampler. This sampler takes periodic cuts, or samples, from a stream of moving material, either wet or dry, at any stage of a continuous process. The unit is entirely automatic. While it is particularly adapted to mining stone products or chemical and allied processes industry, this unit might also find application in the sampling of dewatered sewage sludge, for example.

To obtain further information on this new unit, use a Reader Service Card, on which is entered the above key number and your name and address.

if you are burning or burying the sludge from your sewage plant, be sure to write for our free booklet "Sewage Sludge *Utilization Datalog*". Find out how easily you can process sludge cake into saleable fertilizer. The picture above tells you why farmers, gardeners, florists, nurserymen and park superintendents value sludge so highly as a plant food. The picture below shows a ROYER SLUDGE DISINTEGRATOR, the machine that automatically shreds and aerates sludge cake (up to 56% moisture content) and blends in any desired amount of chemical fertilizer. A Royer machine will enable you to show a profit on sludge disposal, in place of the "loss" accepted needlessly by so many treatment plants. Write today for DATALOG.

Model NSD-P at Omaha plant. Handles up to 12 cu. yds. per hour.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

805

Shovel Loader

Tractomotive Corp., Deerfield, Ill., has announced another Materials Handling Tractor, the Model TL-B TractoLoader, with a ten cubic feet standard bucket, mounted on rubber tires, with a hydraulically controlled bucket that can be dumped in whole or in part from a height of

approximately 5 ft. This new unit features a forward crowd action and an automatic "tilt-back" that permits getting a load without ramming. The TL-B is designed primarily to work in congested areas where working space is small.

To obtain further information on this unit, use a Reader Service Card on which is entered the above key number and your name and address.

Dr. Sussman Chief Chemist Water Service Laboratories

Announcement has been made that Sidney Sussman, Ph.D., has become associated with the Water Service Laboratories, Inc., of New York, as chief chemist. Dr. Sussman for the past three years was chief chemist of the Liquid Conditioning Corp., where he supervised all laboratory functions. Prior to that time for six

years he had been successively research chemist, group leader and chief research chemist of the Permutit Co. He was also associated with the experimental station of E. I. duPont, following his graduation from M.I.T. in 1937.

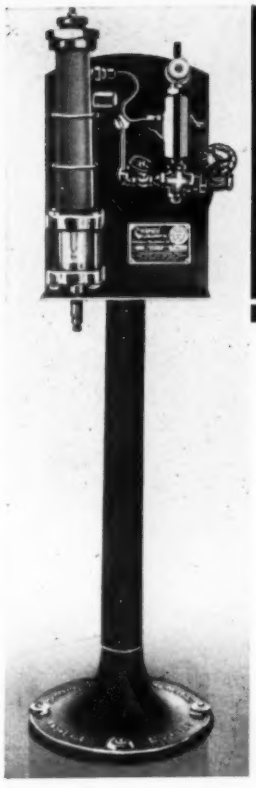
Among the items for which Dr. Sussman is known is his contribution to the development of the seawater desalting process for which he received a War Dept. Citation.

Water Service Laboratories, Inc., specializes in a series of corrosion prevention services designed to minimize scale and corrosion in air conditioning systems and boilers.

Worthington Moves Water Treating Division

Worthington Pump and Machinery Corp., Harrison, N. J., has announced the expansion of the Water Treating Equipment Sales Division and the transfer of that division to the Corporation's Dunellen Works, Dunellen, N. J. The transfer is being made from the Harrison Works, where this equipment has been produced for the past ten years, due to increased activity in this field, and the fact that the Dunellen Works production facilities are particularly well suited to this type of manufacture.

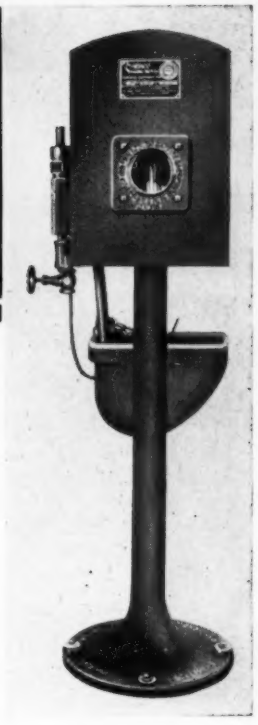
Products involved in the transfer are hot process water softeners, both deaerating and non-deaerating types, cold process slurry type softeners and coagulators, zeolite softeners, including deionization systems and pressure filters for general purpose filtration.



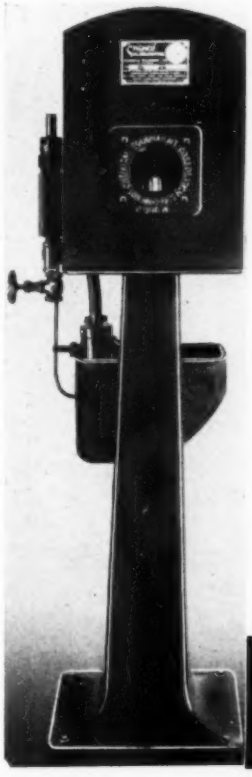
CHEMCO Type M-5
CHLORINATOR
CAPACITY RANGES
0-10 lbs. per 24 hours

Chemco
CHLORINATORS

Chemco Chlorinators are the result of nearly 25 years experience in water treatment and are used in 42 of the 48 states and foreign countries.. They have outstanding design features as shown below...



CHEMCO Type M-3
CHLORINATOR
CAPACITY RANGES
0-10, 0-15, 0-25
lbs. per 24 hours



CHEMCO Type M-1
CHLORINATOR
CAPACITY RANGES
0-10, 0-25, 0-50
0-100, 0-200, 0-300
lbs. per 24 hours

1 *CHEMCO Chlorinators are simple, sturdy and foolproof in design.*

2 *CHEMCO Chlorinators are all based on vacuum design*

3 *CHEMCO Chlorinators can be flooded with water without damage.*

4 *CHEMCO Chlorinators have no regulator plates, springs or diaphragms to eat out and cause expensive repair cost.*

5 *CHEMCO Chlorinators have no moving parts working in an atmosphere of wet chlorine gas.*

For further information and literature, write

CHEMICAL EQUIPMENT COMPANY

P. O. BOX 3098, LOS ANGELES 54, CALIFORNIA

911 Harrison St.
San Francisco 7
California

205 W. Wacker Dr.
Chicago 6
Illinois

30 Church St.
New York 7
New York

Offices or Agents in Principal Cities of the U.S.A. and Throughout the World

806

Mobile Radio Telephone Unit

The Federal Telephone & Radio Corp., 100 Kingsland Rd., Clifton, N.J., has developed a new, highly economical mobile radio telephone unit, which offers outstanding reliability through the use of improved circuits and components of that company.

This unit, due to its small size, low cost, reliable performance and versatility, will find application not only in communications between a water department and its service trucks for maintenance purposes, but it is also useful in water main cleaning work, and in maintaining communications in valve servicing, etc.

To obtain further information on this unit, use a Reader Service Card on which is entered the above key number and your name and address.

807

Cuprose For Algae Control

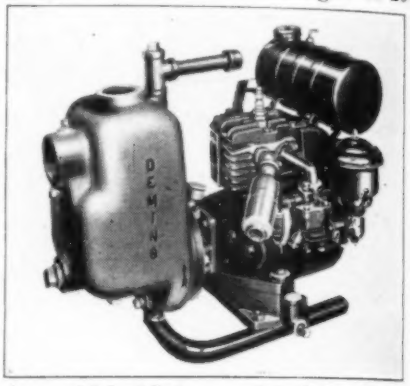
National Aluminate Corp., 6220 W. 66th Pl., Chicago 38, Ill., has announced the availability of Nalco "Cuprose," a copper citrate combination, used for the control of algae in cooling systems, municipal water reservoirs, or swimming pools. Among the advantages of "Cuprose" over ordinary copper sulphate is that it is stable, and remains in solution in alkaline water. It will therefore be from two to five times as efficient as copper sulphate on a pound-for-pound basis. Nalco Cuprose is a granular material, furnished in 100 lb. paper bags, shipped from East Point, Ga. Cuprose is no more toxic to fish than is copper. It is recognized that an overdosage, however, will affect the fish life.

For further information on this new material and its application, use a Reader Service Card on which is entered the above key number and your name and address.

808

Portable Self-Priming Centrifugal Pump

The Deming Co., Salem, Ohio, has designed and developed a new, self-priming, centrifugal pump, equipped with a 1½ hp. 4-cycle, air-cooled gasoline engine. This pump, of iron casting and bronze color, weighs only 83 lb., and has a length of 20



in., width 13 in., and height 19 in. The performance ratings of this pump range from 10 gpm. with 80 ft. head, to 90 gpm. with 15 ft. head.

To obtain further information on this new portable, self-priming centrifugal pump, use a Reader Service Card on which is entered the above key number, your name and address.

Superior Performance
TENNESSEE CORPORATION
ferri-floc
FERRIC SULPHATE
Atlanta, Georgia
...of a Superior COAGULANT
SEVEN ADVANTAGES OF FERRI-FLOC
1. Coagulation is effective over a much wider pH range than with other coagulants. Color flocs may be formed in the very acid range where other coagulants may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10 or even higher for the removal of turpidity and manganese.
2. The time required for floc formation, conditioning and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen Sulphide is removed and taste and odors improved.
7. Ferri-Floc does not seem to stick to sand grain to form mud balls, and is subject to less "breaking through" on the filters.
Let us send you FREE, this valuable booklet on Ferri-Floc.
Write TENNESSEE CORPORATION,
Grant Bldg., Atlanta, Ga.
Many of the country's larger plants are now recognizing the advantages offered by Ferric Coagulants and are taking advantage of them through Ferri-Floc. — Ferri-Floc eliminates the troubles encountered with other coagulants by improving general quality, reducing overall cost. — All of this is accomplished without costly changes in plant equipment.
TENNESSEE CORPORATION
Atlanta, Georgia
Lockland, Ohio

Chain Belt Appointments

Chain Belt Co. of Milwaukee has announced the appointment of Charles Moeller as District Sales Engineer to the Kansas City Office. Mr. Moeller is a graduate of Purdue University and took Post Graduate work at the University of Michigan.

Announcement has also been made of the appointment of Charles Pingry as District Sales Engineer to the Dallas Office. Mr. Pingry is also a graduate of Purdue University in mechanical engineering.

809

Chrome Lock Protective Gasketing

Products Research Co., 5426 San Fernando Rd., Glendale, Calif., has produced a specially compounded and impregnated felt, containing zinc chromate as a corrosion inhibitor. This material is used for protective gasketing or sealing between all types of faying surfaces such as flanges and lapped or butted joints.

Under bolted, screwed or nailed pressure the resins traverse within the felt and are also extruded onto the faying surfaces in sufficient quantities to form a protective dam. The resultant seal provides both the exclusion or retention of air, water, dust, etc.

The material is available in four thicknesses and in various widths and lengths. It is also available as a stamped gasketing to fit individual requirements.

To obtain further information on this new product, use a Reader Service Card on which is entered the above key number and your name and address.

810

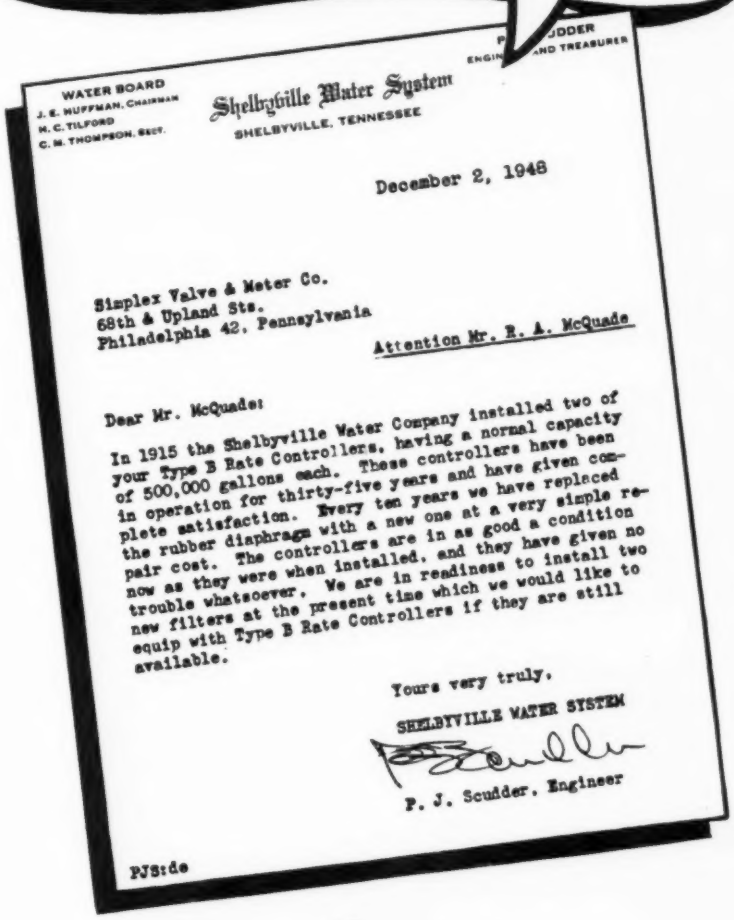
Jackhamer

Ingersoll-Rand Co., Phillipsburg, N.J., has introduced a new medium weight Jackhamer. Known as the J-40 Jackhamer, the new machine is similar to the heavier model and has special applications of its own. It is capable of drilling in any kind of rock and is

Here's proof SIMPLEX is the finest...

"IN OPERATION 35 YEARS— COMPLETE SATISFACTION"

...says P. J. Scudder, Engineer, Shelbyville Water System



WATER BOARD
J. E. HUFFMAN, CHAIRMAN
H. C. TILFORD
C. N. THOMPSON, SEC'Y.

Shelbyville Water System
SHELBYVILLE, TENNESSEE

December 2, 1948

Simplex Valve & Meter Co.
68th & Upland Sts.
Philadelphia 42, Pennsylvania

Attention Mr. R. A. McQuade

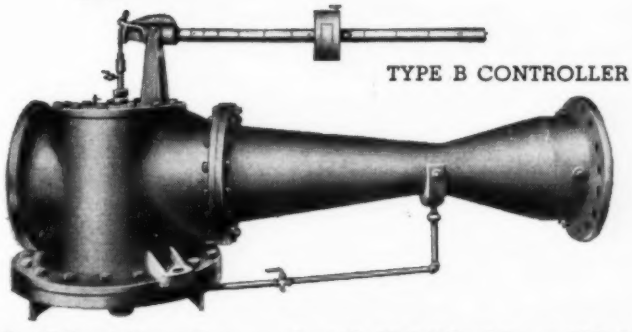
Dear Mr. McQuade:

In 1915 the Shelbyville Water Company installed two of your Type B Rate Controllers, having a normal capacity of 500,000 gallons each. These controllers have been in operation for thirty-five years and have given complete satisfaction. Every ten years we have replaced the rubber diaphragm with a new one at a very simple repair cost. The controllers are in as good a condition now as they were when installed, and they have given no trouble whatsoever. We are in readiness to install two new filters at the present time which we would like to equip with Type B Rate Controllers if they are still available.

Yours very truly,
SHELBYVILLE WATER SYSTEM

P. J. Scudder, Engineer

PJS:de

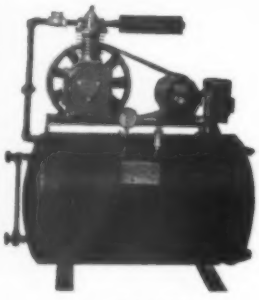


TYPE B CONTROLLER

The Simplex Valve & Meter Company, Dept. 8, 6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY



No. 2V-APCO

APCO-V-APCO PRIMERS

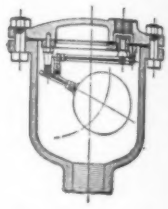
AUTOMATIC POWER OR TANK PRIMERS

AIR RELEASE VALVES

FOR

FILTER PIPE LINES—DISTRIBUTION LINES
AND OTHER USES

17 TYPES



No. 200 VALVE

VALVE AND PRIMER CORPORATION **127 N. Dearborn St., Chicago 2, Ill.**

particularly well suited for general utility service in mines, quarries, and road work.

To obtain further information, use a Reader Service Card on which is entered the above key number and your name and address.

Mathieson Announces Changes in Sales Department

Mathieson Chemical Corp. has announced changes in its Sales Department executive staff, as the result of the retirement of E. E. Routh, Vice President, Director of Sales. D. W. Drummond has been named Vice President, Director of Industrial Chemical Sales and S. L. Nevins has been named Vice President, Director of Agricultural Chemical Sales.

Other appointments include J. O. Logan to the position of Sales Manager of Industrial Chemicals, and R. J. Quinn, Asst. Sales Manager, Industrial Chemicals; L. P. Thomas becomes Southwestern Sales Manager, Industrial Chemicals; J. S. Whittington, Sales Manager, Agricultural Chemicals. Mr. Thomas will be located in Houston, Texas, and Mr. Quinn and Mr. Whittington will be located in Baltimore, Md. All others are in Mathieson's executive offices.

811

Trenching Equipment

The Construction Products Corp., 4345 E. Imperial Highway, Lynwood, Calif., are now marketing a "Profit Trencher," the unique trenching device which has been added to a Profit Loader. This new device, which will dig trenches inexpensively up to 52

CORROSION RESISTING

get PERMANENCE

LASTS FOR CENTURIES

McWANE

B&S PIPE

For quick installations use McWane B&S cast iron pipe.

Easy to cut . . . handle . . . tap . . . lay. Meets rigid Standard Class 150 Federal Specifications. 500-pound test.

•

PROMPT SHIPMENT
4" and Larger Sizes

ALL SIZES 2" thru 12"

McWANE CAST IRON PIPE CO.

Birmingham 2, Alabama

A CLEAN CUT
IN 3 MINUTES
Through 18" A-C with
SPRING LOAD A-C!
PAYS ITS COST ON ONE JOB!
Because it cuts many times faster than any other method, and requires but one tenth the maintenance, SPRING LOAD A-C means real economy. No preliminary multiple parts assembly necessary . . . takes but a few seconds to set up . . . one man can handle. Basic tool cuts 3" to 8" pipe. Extensions available for handling larger pipe. Ask your jobber or write.
H. D. FOWLER CO., Inc.
P.O. Box 3084
Seattle 14, Wash.

in. deep and from 12 in. to 18 in. in width, is a handy unit for water and sewage works. The device also contains the loader which can be used to backfill the trench. The cross-conveyor on the Profit Trencher is adjustable in or out to any desired intermediate position. The unit has 8 forward and 2 reverse tractor creep speeds, ranging from 2 ft. per minute to 20 ft. per minute, plus the 4 standard tractor speeds. Two wheel speeds combine with the 10 tractor creep speeds to provide 20 different digging combinations to meet various soil conditions.

Water or sewer departments which have trenching problems should investigate this new item. To obtain further information, use a Reader Service Card, on which is entered the above key number and your name and address.

LITERATURE AND CATALOGS

812
ELEVATED STEEL TANKS

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., has issued a 20-page bulletin on **Modern Water Storage in Elevated Steel Tanks.** This bulletin contains pictures of various types and sizes of elevated steel tanks, together with tank dimensions and capacities and other helpful material on elevated tank design and application. It is just off the press.

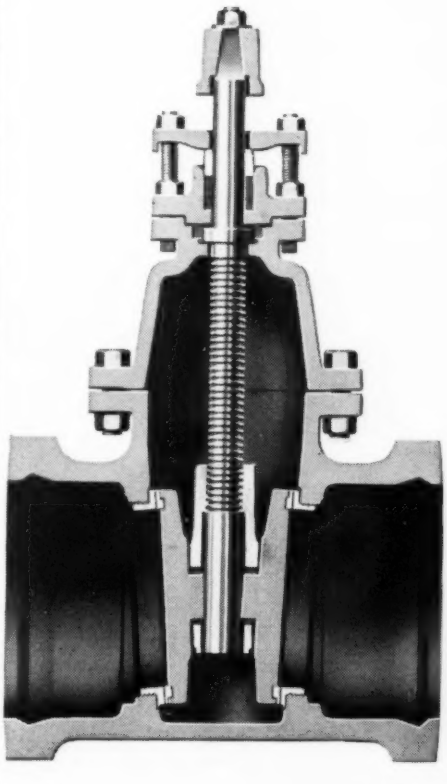
To obtain a copy of this new booklet on Modern Water Storage, use a Reader Service Card, on which is entered the above key number and your name and address.

813
SPAULDING PRECIPITATOR

The Permutit Co., 330 W. 42nd St., New York 18, N.Y., has released a bulletin on the **Permutit Spaulding Precipitator.** This 12-page bulletin shows a diagram of the Spaulding Precipitator, describes its principles of operation, discusses the design of the equipment, the advantages of the equipment to fit chemical requirements, adaptability to variable rates of flow and other factors. Also discussed are features of the Precipitator in lime softening and other special applications.

To obtain a copy of this bulletin, use a Reader Service Card on which the above key number and your name and address are entered.

R. D. WOOD GATE VALVES stand on their RECORD



● GATE VALVES are buried deep underground and too often forgotten—and yet, if the critical day comes, they *must* not fail.

The record of R. D. Wood Gate Valves inspires confidence. They have been demonstrating their reliability for generations—proving the soundness of their design. Only three moving parts—spreader and two discs. The discs are free to rotate their full circumference when raised and lowered—are not subject to wear at any one point. In closing, pressure is applied from the center, the discs seating tightly and without distortion. There are no pockets to collect sediment. Fully opened, the valve permits an unobstructed flow of water.

For the safety of your community, specify R. D. Wood Gate Valves, the gate valves with the record of dependability. Send for complete information today.

Seasoned castings. Rigidly inspected. For working pressures up to 175 lbs. Tested to 300 lbs. Conforming to AWWA specifications. Bell or flanged ends, or to connect with any standard type of joint. Sizes 2" to 30".

Be extra safe. Operate all valves at least once a year.

R. D. WOOD COMPANY
Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (Centrifugally Cast in Sand Molds)

BOND-O

A safe self-caulking, self-sealing compound for jointing water mains. Used with complete confidence. Machine-blended for absolute uniformity. All BOND-O contains a germicide to inhibit oxidation by sulfur bacteria.

Northrop

Northrop & Company, Inc.
SPRING VALLEY, N. Y.

Every Bond-o Joint is a Good Joint

To improve floc formation

N-SOL PROCESSES FOR WATER COAGULATION

use "N"® Sodium Silicate to produce ACTIVATED SILICA SOL.

A reactant such as ammonium sulphate, chlorine or sodium bicarbonate with "N" Silicate yields N-Sol (activated silica sol).

Write for bulletins.

PQ

PHILADELPHIA QUARTZ CO.
1166 Public Ledger Bldg., Phila. 6, Pa.

FOR BETTER
pH Control
and WATER TESTS
there is nothing like
NON-FADING
GLASS COLOR
STANDARDS

Pocket
Comparator
No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of technique, and compactness of the apparatus are exclusive features of Hellige Comparators.

WRITE FOR BULLETIN No. 602

HELLIGE
INCORPORATED
3718 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

814
PIPE SAW

The E. H. Wachs Co., 1525 North Dayton St., Chicago 22, Ill., has issued a 4-page folder on the **Wachs National Pipe Saw.** This bulletin shows the pneumatic pipe cutting saw, capable of cutting cast iron pipe of various sizes from 12 in. through 48 in. Pictures are shown to illustrate how the saw works.

To obtain a copy of this bulletin on this unusual pipe saw, use a Reader Service Card, on which is entered the above key number and your name and address.

815
PIPE CLEANING TOOLS

Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles 34, Calif., has announced in a new bulletin a new policy, known as the **For Sale, Lease or Contact Policy.** This bulletin shows the various types of cleaning equipment which are used for cleaning pipe lines and sewers, and it advertises the fact that these may be either purchased, leased, or used on contract.

To obtain a copy of this recent bulletin by Flexible, use a Reader Service Card, on which is entered the above key number and your name and address.

816
LARGE METERS

Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia 42, Pa., has issued a 6-page bulletin on the **Simplex W-K Principle and Type MO Meter,** for measuring flow through turbines. The bulletin describes the W-K principle and the W-K differential taps. Also shown and described are the Simplex type MO meter and the Simplex type MAP Monometer. Another page shows installation details and the bulletin is completed with pictures of representative installations.

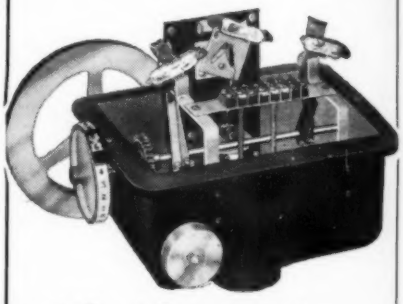
If you are interested in the measurement of flows through turbines, this bulletin may be obtained by using a Reader Service Card on which is entered the above key number and your name and address.

817
THE ACCELATOR

Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill., has issued a new bulletin on the **"Accelator."** This bulletin, containing 26 pages, covers such items as historical developments, the design of the apparatus, the operation of the process (presented in color diagrams), and the characteristics of the equipment. Advantages of the equipment, as well as design considerations and operation information are also presented. A number of applications and actual installations are shown for industrial water treatment, municipal water treatment, boiler feed water treatment, cooling water treatment and industrial waste treatment.

For persons interested in high rate water treating and industrial waste and sewage treatment, this book will be of help. To obtain a copy, use a Reader Service Card on which is entered the above key number and your name and address.

RF-2 Roto-Trol



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818
POROUS FILTER BOTTOMS

Walker Process Equipment, Inc., 33 Hoyt Place, Aurora, Ill., has issued a bulletin on the **Camp Porous Bottoms for Rapid Sand Filters.** This bulletin contains the history of the development of the Camp porous filter bottom, shows a picture of how it is installed, and discusses its design, advantages, and such engineering features as head loss, loading, filter run, and the use of surface wash, etc.

To obtain a copy of this descriptive bulletin, use a Reader Service

Card on which is entered the above key number and your name and address.

819

ACTIVATED CARBON USAGE

Industrial Chemical Sales Div., of West Virginia Pulp & Paper Co., has available a 12-page bulletin on the **Storage, Handling, and Feeding of Activated Carbon.** This bulletin is an extract from the book, "Taste and Odor Control and Water Purification," published in 1947. If you do not have a copy of this reprint, we suggest that you obtain one.

To obtain a copy, use a Reader Service Card, on which is entered the above key number and your name and address.

820

SEWER JOINT COMPOUND

Presstite Engineering Co., 3900 Chouteau Ave., St. Louis 10, Mo., has just released its 1949 catalog on **Sewer Joint Sealing Compound.** This new catalog contains all the latest developments and methods of application for the various types of sealers used for sealing sewer joints.

Included in the bulletin is a discussion of Kalktite, cold applied asphaltic sewer joint compounds, amounts of sealing material required, specifications for the material, as well as other materials, such as Kalktite No. 342, Sulpho-Seal, and ready-mix joint compound.

To obtain a copy of this informative bulletin on sewer joint sealing compounds, use a Reader Service Card on which is entered the above key number and your name and address.

821

COMMINUTOR

A recently described piece of new equipment in these columns was the Worthington Comminutor. The Worthington Pump & Machinery Corp. has now issued a bulletin on the **Worthington Comminutor.** This bulletin gives the general description of the equipment, shows the advantages of the Comminutor, describes how it functions, discusses its construction details and the selection and application of the equipment. Characteristic curves are presented, as are dimension diagrams and suggested channel designs.

To obtain a copy of this bulletin on the Worthington Comminutor, use a Reader Service Card on which is entered the above key number and your name and address.

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822

MAIN LINE METERING

R. W. Sparling Co., Box 3277, Terminal Annex, Los Angeles 54, Calif., has available a 4-page folder on **Accurate Main-Line Measurement.** This folder shows Sparling Meters and Sparling Compound Meters, as well as various other units manufactured for metering large and small volumes of water.

To obtain a copy of this folder, use a Reader Service Card on which is entered the above key number and your name and address.

823

PROTECTIVE COATINGS

The Barrett Div., Allied Chem. & Dye Corp., 40 Rector St., New York, N. Y., has available a book on **Water Works Protection.** This bulletin shows the use of Barrett Water Works Enamel for pipe coating, both inside and outside. The book is amply illustrated, with many pictures of various installations of cast iron and steel pipes for water works services, all of which have been coated with Barrett Coatings.

To obtain a copy of this bulletin, use the Reader Service Card on which is entered the above key number and your name and address.

824

ION EXCHANGE

The Resinous Products Div. of Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa., has published a bulletin on ion exchange resins. The bulletin is titled **The Amberlites** and discusses the use of synthetic ion exchange resins.

A companion bulletin on ion exchange is the July, 1948, issue of **The Resinous Reporter,** which contains a complete discussion of the evolution of ion exchange resins, how they work, operating capacities, mixed-bed deionization, a glossary, and a bibliography of ion exchange.

To obtain copies of these bulletins, use a Reader Service Card on which is entered the above key number and your name and address.

825

ALTIMETER

Wallace & Tiernan Products, Inc., Belleville 9, N.J., has issued a bulletin on the **W&T Sensitive Altimeters.**

This bulletin describes the unit which may be used as a surveying unit and which gives quick, accurate results in determining profiles.

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There are two standard ranges, 6,000 and 15,000 ft., and the bulletin shows the different types of carrying cases for these altimeters.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

826

SLUDGE DRYER

Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa., has available a bulletin on the **Link-Belt Roto-Louvre Dryer.**

This bulletin describes the so-named type of dryer which has been applied to use in sewage plants for sewage sludge drying. The bulletin is complete in its presentation of the design, construction, and operating principles of the dryer.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

827

METER SETTING EQUIPMENT

Mueller Co., Decatur, Ill., has released a bulletin on **Mueller Meter Setting Equipment.** This 26-page bulletin on heavy stock contains diagrams of typical water meter installations and a complete catalog of Mueller copper water meter yokes of various sizes and designs. In addition, copper meter fittings are pictured and listed. In short, this book is a complete catalog of Mueller Equipment for Meters and Meter Settings, as well as Water Meter Box Covers.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

828

LIGHTWEIGHT CENTRIFUGAL PUMPS

The Gorman-Rupp Co., Mansfield, Ohio, has issued a 4-page bulletin on **Self-Priming, Centrifugal Lightweight Pumps.** This folder shows the three sizes, the Midget, the Hawk, and the Eagle. These self-priming pumps are shown in action and in diagrams, illustrating the priming and pumping action, as well as sectional views.

To obtain a copy of this folder which describes and illustrates these three sizes of lightweight self-priming centrifugal pumps, use a Reader Service Card on which is entered the above key number and your name and address.

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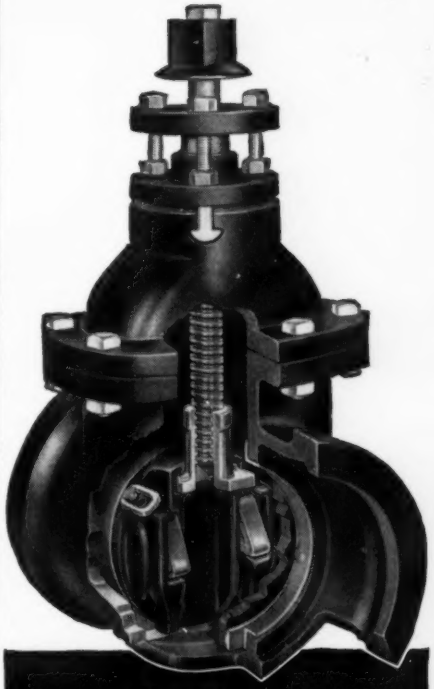
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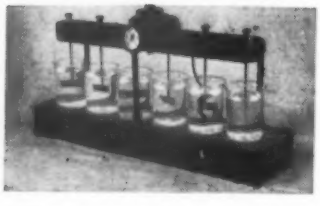

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829

EMERGENCY CHLORINATION

Wallace & Tiernan, Newark 1, N. J., has issued a 2-page sheet on a **W & T Emergency Portable Chlorinator.** This unit was developed for emergency chlorination and main sterilization. The unit is shown in pictures and is described completely.

To obtain a copy of this data sheet on the emergency portable chlorinator, use a Reader Service Card on which is entered the above key number and your name and address.

830

FIRE HYDRANTS

Darling Valve & Mfg. Co., Williamsport, Pa., U.S.A., has available a catalog on **Fire Hydrants.** This catalog is complete with a listing of accessories and special construction features, A.W.W.A. Specifications, construction and operation, design, dimensions, installation, maintenance, parts, and various types of Darling Fire Hydrants. Photographs of installations are also shown.

To obtain a copy of this catalog on Fire Hydrants, use a Reader Service Card on which is entered the above key number and your name and address.

831

OPPOSED IMPELLER PUMP

De Laval Steam Turbine Co., Trenton 2, N.J., has just released the new bulletin on the **De Laval Opposed Impeller Pump.** This bulletin, which contains 12 pages, consists of pictures and diagrams, showing these De Laval opposed impeller pumps. There is also a discussion of the advantages of this type of pump, and a complete cutaway drawing, showing how it works. Also included are dimensions and specifications for various size pumps.

To obtain a copy of this new bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

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832

RIVER GAUGE

Leupold & Stevens Instruments, 4445 N. E. Glisan St., Portland 13, Ore., has issued a recent copy of the **Hydromike.** In this booklet is described the Robot River Reporter, which is the Stevens Telemark for measuring water levels. There are other stories in this June, 1949 issue of the *Hydromike*.

To obtain a copy, use a Reader Service Card on which is entered the above key number and your name and address.

833

SHORT SETTING PUMPS

Layne Central Co., 1993 Chelsea Ave., Memphis, Tenn., has issued a 4-page bulletin on **Layne Short Setting Pumps.** These pumps are used for cooling towers, high service pumping, river and lake booster pumps, fire pumps, circulating pumps, process pumping, dewatering and pit drainage. The bulletin shows various installation diagrams of this particular type of equipment.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

834

MECHANICAL FLOW METER

Builders-Providence, Inc., Providence 1, R.I., has available a bulletin on the **"Flo-Watch",** a recording, indicating, and totalizing mechanical flow meter.

This bulletin shows pictures of installations of these various Flo-Watch units, including the recording, recording and indicating, recording and totalizing, and the recording, totalizing, and indicating units.

To obtain a copy of this bulletin on the "Flo-Watch" meter, use a Reader Service Card on which is entered the above key number and your name and address.

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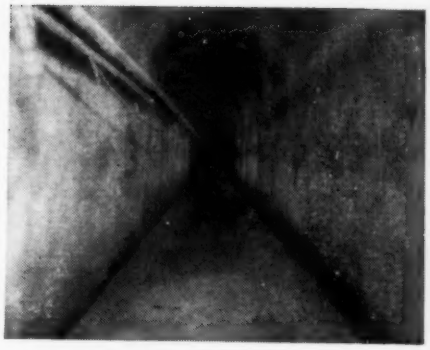
835

CHLORINIZER

Builders-Providence, Inc., Providence 1, R. I., has issued a bulletin on the **Builder's Chlorinizer,** Volumetric Model CVS. This model, which was recently described in the section on new equipment in an issue of *Water and Sewage Works,* is designed to accurately meter chlorine gas and to produce and deliver a chlorine water solution. It is equipped with automatic safety devices which shut off the flow of chlorine gas, if necessary, for safety; its features include positive and accurate sight flow chlorine rate indicator, wide range metering without changing orifices, elimination of tray-produced chlorine odors and visible positive evidence of effective vacuum.

This 4-page bulletin not only shows a cutaway drawing of the unit and an operation diagram in color, but also discusses other advantages and safety features and the application and installation of the unit.

To obtain this bulletin on this new piece of equipment, use a Reader Service Card on which is entered the above key number and your name and address.



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The picture at the left shows an old concrete storm sewer in Washington, D. C., badly disintegrated and honeycombed. Flow value was low due to roughness. This sewer was reconditioned by chipping away the worst areas, sandblasting the entire surface and applying a "GUNITE" lining.

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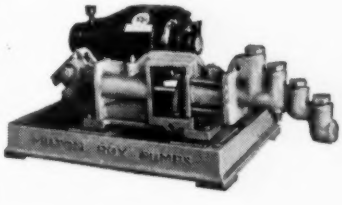

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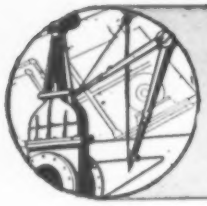

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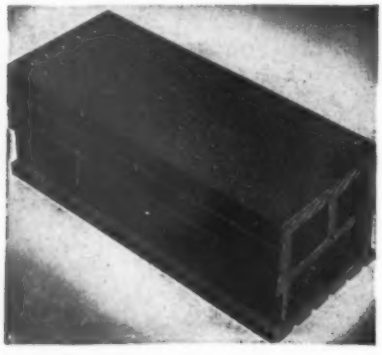

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Bulletin on POROUS MEDIA

by CARBORUNDUM

TRADE MARK

NO. 4 AUGUST, 1949

Porous Plate Bottom Fits All Filter Structures

Adaptability features the ALOXITE aluminum oxide porous bottom. Since its introduction 15 years ago, not a single structural condition, either new or old, has prevented its usage. Thus, the basic benefits resulting from graded gravel elimination are available to every situation. Such troubles as upset beds, mud balls, excessive wash water, and loss of filter media disappear. Advantages of the ALOXITE underdrain system apply to all three classifications of installations:

OLD FILTERS. ALOXITE plates can be installed in any structurally-sound old filter. Rehabilitation cost is minimized because fewer alterations to existing structures are required. This is experienced-proved! Many of the more than 200 ALOXITE bottom installations are in old filters.

NEW PLANTS. The adaptation of ALOXITE plates to a new design structure is simple. It also affects an important initial cost saving. With graded gravel eliminated, filter bed depth is decreased to permit reduction in vertical dimensions.

SPECIAL INSTALLATIONS. Special plates are made to fit the periphery of any circular filter, either gravity or pressure type. Single discs are supplied for small filters or softeners up to 36″ in diameter. Trapezoidal shaped plates are made for annular shaped filters.

Properties of ALOXITE Porous Media

MATERIAL	Ceramically bonded crystalline aluminum oxide grain of controlled sizes.
GRADES (Pore size)	**Filter Underdrains**... coarse and very coarse. **Direct Filtration**... range from very fine to medium. **Diatomite Support**... range from fine to medium. **Air (gas) Diffusion**... range from fine to coarse (permeability from 10 to 120.)
SOLUBILITY	**In Water and Air**... insoluble at all normal operating temperatures. **In Acids**... generally resistant at all operating temperatures, except to hydrofluoric acid. **In Alkaline Solutions**... ceramic bonds are progressively soluble with time and temperature increases.
STRENGTH	Transverse breaking strength is relatively good ranging from 1000 lbs./sq. in. (coarse grades) to 3000 lbs./sq. in. (fine grades).
REFRACTORINESS	All grades withstand up to 900° C. without softening.
THERMAL SHOCK RESISTANCE	Withstand changes up to 20° C./hr. (Where more severe heat shock exists, ceramically bonded silicon carbide porous media are available.)
POROSITY	Ratio of pore volume to total volume of all grades approximately 35%.
WEIGHT	Approximately 0.09 lbs./cu. in.

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

POROUS BOTTOM TRICKLES...

One of the first installations of ALOXITE plates was in a shallow filter designed for a 12″ rise of wash water. By eliminating graded gravel the wash rate was doubled to 24″ and other favorable results realized.

Standard ALOXITE porous plates serve one foot square of filter area. Other rectangular shapes are manufactured regularly for old or new filters not built to even foot dimensions.

In a large installation of horizontal pressure softeners, zeolite losses through the underdrains amounted to a considerable figure. Through the simple installation of ALOXITE plates this expensive loss was stopped completely.

Substantial savings in operation and maintenance costs are a primary advantage of porous plate underdrains. In new installations first cost, too, may be much lower.

TECHNICAL DATA

on porous media and their application

is available on request. You may obtain any or all of the following engineering bulletins by writing Dept. O 89.

No. 1—Aeration of Sewage and Water.

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These accomplishments and such additional benefits as longer filter runs and iron and manganese removal are typical of what you receive with the Break-Point Process backed by W&T Equipment.

In the complete line of W&T chlorinating equipment, proved by over 35 years' experience all over the world, there is a chlorinator that will give *your* plant these benefits, too.

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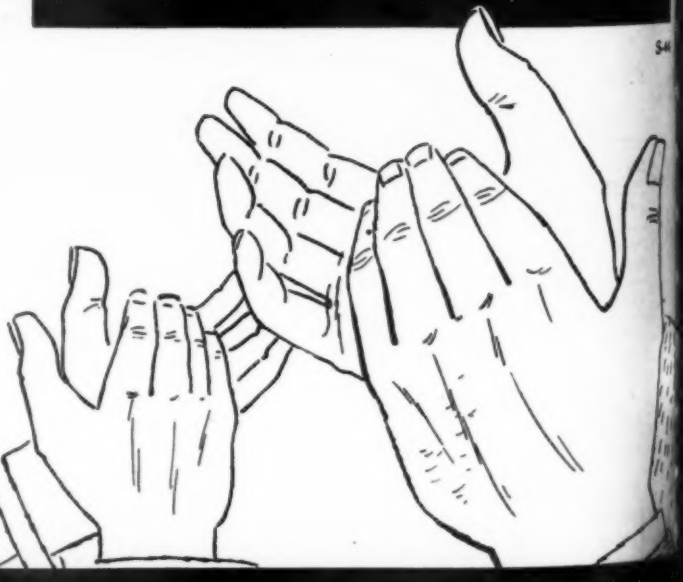
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